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ANALYZING THE POWER LOAD.

Many interesting and suggestive points may be determined through the analysis of central-station power business. Comparisons in this field are worth making, for the more one knows about unit figures of load and revenue, the better equipped one becomes to direct future development. It is desirable to make such analyses from both the internal and external points of view; that is, to compare data for a single plant for various periods and to contrast the operations of different companies.

In a representative analysis of the power loads and earnings from motor service of two stations in the same state some 30 items were tabulated. Some of the figures are worth quoting, for they illustrate the marked difference between a highly developed power business in a community having many diversified manufactures, and motor operations in a territory occupied mainly by a few large industries not as a rule purchasers of central-station service. Both companies serve manufacturing cities, the populations being 110,000 and 150,000, but in the latter case, the amount of energy sold yearly to motor users has increased in the past five years from 916,642 to 13,956,975 kilowatt-hours as a result of energetic cultivation of the field. The larger company was formerly a byword for conservative management, but the adoption of modern ideas with respect to power solicitation, combined with the fact that the territory contains an immense variety of manufactures, led to the remarkable results mentioned.

The smaller company sold 1,555,648 kilowatt-hours to motor users last year, this representing 32.5 per cent of the total energy marketed, whereas 53 per cent of the other plant's sold energy was consumed in motors. The gross earnings from power sales per capita were 54.3 cents and $1.95; the total connected power loads were 26.3 and 75.6 watts per capita; and the average earnings per kilowatt-hour sold for power were 3.84 cents and 2.1 cents. It is noteworthy that the average revenue per kilowatt-hour sold for all uses was 6.65 cents in the smaller system and 3.35 cents in the larger, although the published rates of the two companies were not far apart. The reduction of the total statistics to the unit basis showed that the community with the intensive development was not only buying its power at lower net average costs, but was also buying energy for lighting service at pretty reasonable figures. Where more than half the yearly output of a plant is taken by motor users, the natural result is a low average price per total kilowatt-

hour sold, and unless the lighting rates are unusually high, the average price paid generally looks exceedingly attractive. It is worth noting that in the old days of extreme conservatism the larger plant earned 7.1 cents per kilowatt-hour sold and 5.85 cents per kilowatt-hour consumed by motors; whereas the adoption of a progressive commercial policy has cheapened the cost of electricity to the entire community in both power and lighting service.

It does not take any extended study to show that the general tendency in central-station practice among progressive companies is toward a large volume of business at a relatively small unit profit. From some points of view it is unquestionably a harder task to conduct such a company than to run one in which business is accepted as it comes in but where no intensive cultivation of the load is practiced. Human nature favors doing a comparatively small amount of business at high rates of return, when it comes to the individual, but the demands of the times upon modern public-service corporations are away from this policy. In the interests of the greatest good of the greatest number the popularization of service on a small margin of profit is also likely to be acceptable to the public and to state commissions, and in the long run the incentive thus furnished to make use of electrical conveniences and all sorts of industrial appliances tends to increase the prosperity of the company.

It is interesting to realize that even the figures of power income cited above do not represent the saturation point of the community in the case of the larger company. Only 6.4 per cent of its customers are using motors, although the average income per horsepower of motors connected is $19.20 per year and the average annual revenue derived per power customer is $475, compared with $15.40 per horsepower per year and $117 per power customer per year in the case of the smaller company. In passing, it may be noted that 14 per cent of the total connected motor capacity was in use all the time in the larger company's system against only 6.1 per cent in the other case.

All these unit analyses throw light upon the conditions under which one of the most important departments of central-station activity earns its income, and the compilation of such data is a worthy object for the central-station man with a leaning toward statistics.

FLEXIBLE MOTOR MOUNTINGS.

The effectiveness of the motor drive can often be much increased at little additional expense by providing a flexible mounting for the equipment. Thus, in a recently completed plant where hundreds of machine tools are electrically operated, the motor brackets were riveted to the steel columns in those portions of the establishment where the group drive was employed. It would have cost little, if any more, to have bolted the supporting structures to these columns, and in the event of tool changes requiring shifting of motors or extensive alterations of shaft speed, the readjustment could be made with the utmost ease. Even on large tools with individual motors geared to the main shafts some range of adjustment in lining up the motor is advantageous. Compensation for wear or for subsequent slight changes in tool fittings is worth thinking about. The builders of a well known make of engine lathe have provided for the vertical and horizontal adjustment of the driving motor belt by conveniently manipulated screw handles on the frame, and the resulting smoothness of operation is making friends for the equipment everywhere. In a great many installations flexibility has been given its due attention, but there are enough layouts of the other kind to warrant reference to the subject at this time.

CO-OPERATION FOR VEHICLE PROGRESS.

We make mention on other pages of this issue of the Boston Electric Automobile Salon, held during the week at the Copley-Plaza Hotel. Over 16,000 invitations were sent to prominent people in the Boston district, and while results are not known at the time of going to press, if the record of last year can be taken as an indication, a gratifying percentage of these "prospects" have attended during the course of the show.

There is nothing commercial about the Boston Salon. No soliciting is permitted and undoubtedly this will cause many timid ones to attend who would hesitate before visiting an ordinary automobile exposition or the salesroom of a manufacturer, although somewhat interested in the electric vehicle. A demonstration, such as the Boston Salon, should create in these lukewarm prospects a desire to know more about the advantages and comforts of the electric passenger car.

An affair such as the Boston show is possible only through the co-operation of all electric-vehicle interests. The Electric Motor Car Club of Boston, the New England Section of the Electric Vehicle Association, the vehicle dealers and the Edison Electric Illuminating Company all have contributed to its success and all are vitally interested in the development of the electric-vehicle industry in the New England district.

Such co-operative activity should be inaugurated in every community, especially where there is a section of the Electric Vehicle Association of America, for only by co-operation can the electric vehicle be advanced to the position which it by all economic laws so justly deserves. Where local co-operation is undertaken such questions as the electric vehicle for parcel-post service, adequate charging rates and facilities, suitable vehicle legislation, etc., can be solved with little or no difficulty.

There are numerous sections of the Electric Vehicle Association of America, all of which are doing good work and accomplishing much. But there seems to be need for more activity along concrete lines, rather than weekly or monthly educational meetings where papers are read and discussed and everyone left to go his own way after the session.

CONSISTENT LIGHTING IN THE ELECTRIC SHOP.

To recommend modern illumination in a present-day electric shop seems absurd. Of all the places in the world to illustrate efficient illumination, an establishment of this kind ought to require the least urging, yet two otherwise well conducted stores recently visited, in which the owners seem to make a profitable living out of the sale of electrical conveniences, fell amazingly short of their possibilities in the way of the simplest display lighting.

One establishment, located in a busy suburban square bordered by enterprising mercantile houses, maintained an attractive sign bearing the words "Everything Electrical" in transparency form directly over its entrance. Here the illumination ceased, except for a single tungsten lamp of possibly 25 watts suspended from the ceiling at the rear of the store. Two windows of large size flanking the doorway and neatly arranged with tasteful displays of heating devices, flashlights and other appliances, were left absolutely dark. Across the street was an educational institution attended by several thousand resident students, and the square was easily seen to be an important electric railway transfer point. Why any dealer in electrical supplies should fail to grasp such an opportunity to call attention to his wares by night as well as by day is not easy to comprehend. A 40-watt lamp with suitable reflector in each window near the ceiling could be operated six hours per night at the 10-cent rate per kilowatt-hour, for less than 30 cents for the entire installation, and probably a quarter of this cost if run on sign rates with separate meter and automatic switching at 11 or 12 p. m. Even a more extensive installation could be run at an almost nominal expense in proportion to the value of the display.

The other store, run by a dealer specializing in lighting material, was located on a side street about 100 feet from an important business center. The dealer operated a large transparency reading "Illuminating Engineer," hung at right angles to the sidewalk and easily seen from the adjacent main avenue of traffic. Two display windows were provided, but the appliances shown were set upon dark red paper, which absorbed a large amount of light, and instead of using adequate lamps and fixtures in the upper portions of the windows the dealer resorted to two canopies of the type used in apartment dining rooms. One of these was equipped with a carbon lamp of low candlepower, and while the other was fitted with a 40-watt tungsten lamp, its height above the display was too great for the best results. Within the store was a neatly arranged assortment of fixtures, including some of the latest semi-indirect apparatus, and the use of this in the windows in place of the domes would have yielded much better results.

Many central stations which maintain display windows make similar mistakes in the application of the energy which they are generating and the appliances which they offer to consumers. A bare, dazzling tungsten filament in the window, for example, is anything but a convincing advertisement for the use of electric illumination in show windows, as well as poor practice in displaying other wares. Yet this was recently observed in the window of a central station whose president is perhaps the most prominent individual in this business in the country.

Doubtless many such departures from the best practice arise from preoccupation and lack of time, but the dealer or company showing the latest devices should take reasonable care to see that where such are applicable to his own establishment full use is made of their effective properties. There are certainly lulls in business which can profitably be devoted to modernizing one's own equipment in the interest of putting the establishment beyond the reach of ordinary criticism from the standpoint of the discriminating patron.

LOW RATE FOR BATTERY CHARGING.

The continued extension of the use of electric vehicles depends to a certain extent upon a favorable rate for electric energy to charge the batteries. Energy, of course, is but one element of the total cost of operating such a vehicle, and is no doubt at times given more weight than it deserves when a selection of motive power is undergoing consideration. It must always remain, however, an element of importance, and every lessening in the cost of the electric energy is an encouragement to the larger use of both the electric truck and the electric carriage.

Every student of electric rate making realizes that energy can be supplied by central stations at off-peak periods at a much lower cost than is involved when full fixed charges must be allotted to each unit of output. In conformity with this condition many of our central stations are making very low rates for types of loads which can be accommodated at off-peak hours, especially when such loads cover long hours of use. Such rates may be applied to motor loads and other industrial processes, as well as to charging vehicle batteries. In the development of this encouragement to vehicle use, however, England is forging ahead of this country, just as she has done in the encouragement of electric heating and cooking.

Frequent references have been made in our columns to the association known as the "Point Fives," made up of representatives of central stations whose consumption charge for energy does not exceed 0.5 penny (or 1 cent) per kilowatt-hour. The rate offered for battery charging is not as low as this, but there are already 60 stations which offer a rate of two cents per kilowatt-hour for charging current used at off-peak hours. To further boost the use of electric vehicles the English Electric Vehicle Committee is to undertake the publication of *The Electric Vehicle,* an organ which for the present will appear quarterly.

National Electric Light Association Transportation Committee Meets.

The Transportation Committee of the National Electric Light Association held meetings on Thursday and Friday of last week at the Hotel Sherman, Chicago. There were present George W. Elliott, chairman, W. S. Hodskinson of Boston, H. N. Sibbald of Cleveland, Ray D. Lillibridge of New York, and G. A. Freeman of Chicago. The committee is making elaborate plans for the convention which will be held at San Francisco, Cal., June 7 to 11, 1915.

The location of the convention city will afford opportunity for the eastern delegates to visit a number of the western hydroelectric projects while en route, and it is quite possible that circular trips over several transcontinental lines will be arranged with side trips scheduled so that there will be a considerable choice of water power and high-tension distribution systems that may be investigated.

It is also possible that other engineering organizations contemplating holding conventions at or about the same time as the National Electric Light Association convention may be invited to join with the Association in participating in one or more of these trips.

Ohio Independent Telephone Meeting.

The convention of the Ohio Independent Telephone Association was held at Columbus, O., on October 29 and 30. In his presidential address, Frank L. Bean, of Mt. Vernon, said that out of a total of 642,651 telephones in Ohio, the independent companies now operate 400,287 and the Bell companies 242,364. The future policy is to follow the lead of the Ohio State Telephone Company, which includes the principal independents of the state.

The directors of the Ohio Independent Telephone Association are: H. L. Beatty, Ravenna; W. H. Bowron, Caldwell; D. J. Cable, Lima; W. H. Carey, Millersburg; H. P. Folson, Circleville; W. B. Gregson, New Philadelphia; W. H. Heseltine, Delaware; Washington Hyde, Warren; G. R. Johnson, Columbus; C. L. Jones, Athens; Frank A. Knapp, Bellows; W. F. Laubach, Akron; C. Y. McVey, Cleveland; S. B. Rankin, South Charleston; W. D. Bush, Greenville; G. P. Thorpe, Wilmington.

Next Institute Meeting.

The 301st meeting of the American Institute of Electrical Engineers will be held in the auditorium of the Engineering Societies Building, 33 West Thirty-ninth Street, New York City, on Friday, November 13, at 8:15 p. m.

Two papers will be presented at this meeting, as follows: "Graphic Method for Speed-Time and Distance-Time Curves," by E. C. Woodruff; and "The Corona Produced by Continuous Potentials," by Stanley P. Farwell.

Joint Illumination Meeting in New York City.

On the evening of November 10 a joint meeting will be held at the Chemists' Club, New York City, by the New York Sections of the American Electrochemical Society, Illuminating Engineering Society, and American Gas Institute. A general symposium on the "Contributions of Chemistry to Illuminating Engineering" will be presented in the following papers: "The Improved Gas Mantle," by Milton G. Whitaker; "Chemistry in the Development and Operation of Flaming-Arc Lamps," by William C. Moore; "The New Tungsten Lamps," by Ralph E. Myers; "The Quartz Mercury Lamp," by R. D. Mailey; "The New Moore Tubes," by D. McFarlan Moore. Several of the papers will be illustrated and accompanied by experiments. An informal dinner at the Chemists' Club will precede the meeting.

Electric Club of Chicago.

That service was the most important factor in public utility operation was emphasized by Robert M. Feustel, chief engineer of the Illinois Public Service Commission, in an address before the Electric Club of Chicago, on October 29. A large majority of the complaints which are brought before the commissions of the various states really originate from some service grievance. Even many important rate cases could be traced to a complaint against service. Mr. Feustel thought that many of the syndicates operating plants in small communities pay too much attention to operating and financial reports and too little attention to the personal relations between manager and the public.

Preceding this address remarks were made by C. R. Gilman, president of the Association of Railway Electrical Engineers; D. L. Gaskill, secretary of the Ohio Electric Light Association, and C. A. Howe, former vice-president of the club.

W. C. Berry, vice-president, presided in the absence of A. R. Bone.

National Electric Light Association Adopts New Qualification for Commercial Section Members.

At a meeting of the Executive Committee of the National Electric Light Association held in New York on October 16, it was decided that on and after January 1, 1915, any Class B member in good standing may at his election become affiliated with the Commercial Section without paying any additional dues, and be entitled to receive the Electrical Salesman's Handbook and additions thereto as they are published from time to time.

Dayton Jovians Compare European and American Methods.

The marked difference between European and American business methods, which is not entirely in favor of the latter, was the timely and interesting subject handled by J. H. Hune, research engineer with the Dayton Engineering Laboratories Company, at a recent meeting of the Dayton Jovians. Mr. Hune, who has devoted considerable time and attention to an investigation of the methods of European manufacturers, in order to enable his company to compete on equal terms with them, pointed out that the painstaking efforts which they make to suit the needs of customers everywhere, as distinguished from the refusal of American manufacturers to depart from their established stock designs and models, has resulted in a greater elasticity abroad than here in this respect, and in a greater variety of commodities being handled, with important effects on commerce.

Louisville Jovians Induct New Statesman.

The last session of the Louisville Jovians was presided over by J. B. Riley, the new statesman of the Order in this section, he having just succeeded James Clark, Jr., head of the company which bears his name. Mr. Riley is representative in the Louisville territory of the Westinghouse Lamp Company of New York. Mr. Clark steps down after five years of service which he has divided over seven years, two years having seen H. I. Wood, of the H. I. Wood Electric Company, and Carl A. Klemm, manager of the local branch of the Westinghouse Electric & Manufacturing Company in the statesman's seat.

Chicago Jovian League.

L. G. Shepard, electrical engineer of the Federal Sign System (electric), was the speaker at the meeting of the Chicago Jovian League on November 2. Mr. Shepard described the new motograph sign located at Michigan Avenue and Randolph Street, which is the largest electric sign of its kind in the world. This sign was illustrated and described in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN for October 3, 1914.

Preceding this the election of officers was held, resulting as follows: Secretary-treasurer, G. A. Freeman; Board of Managers, A. A. Gray, T. G. Grier, Nate Harvey, M. S. Hart, C. R. Kreider and J. G. Wray. Victor Despard was elected Second Tribune.

Equipment of a Large Electric Garage.

By Norman G. Meade.

This article describes a typical up-to-date garage used exclusively for electric vehicles. Diagrams and photographs show the location of the cars, the charging facilities, and the control equipment. Individual panels are partly grouped and in part mounted separately. Central-station energy is utilized.

There is probably no better illustration of the rapid increase in the use of electric vehicles for pleasure purposes than the large garages, found in cities of any considerable size, for the housing and care of such conveyances. The Lake Shore Auto Station, located on North Clark Street in Chicago, serves a thickly populated residential section and is an example of all that is modern in electric garages. The capacity is 120 cars and all available room is occupied, principally by runabouts and coupes, although a few light delivery wagons are housed at the present time.

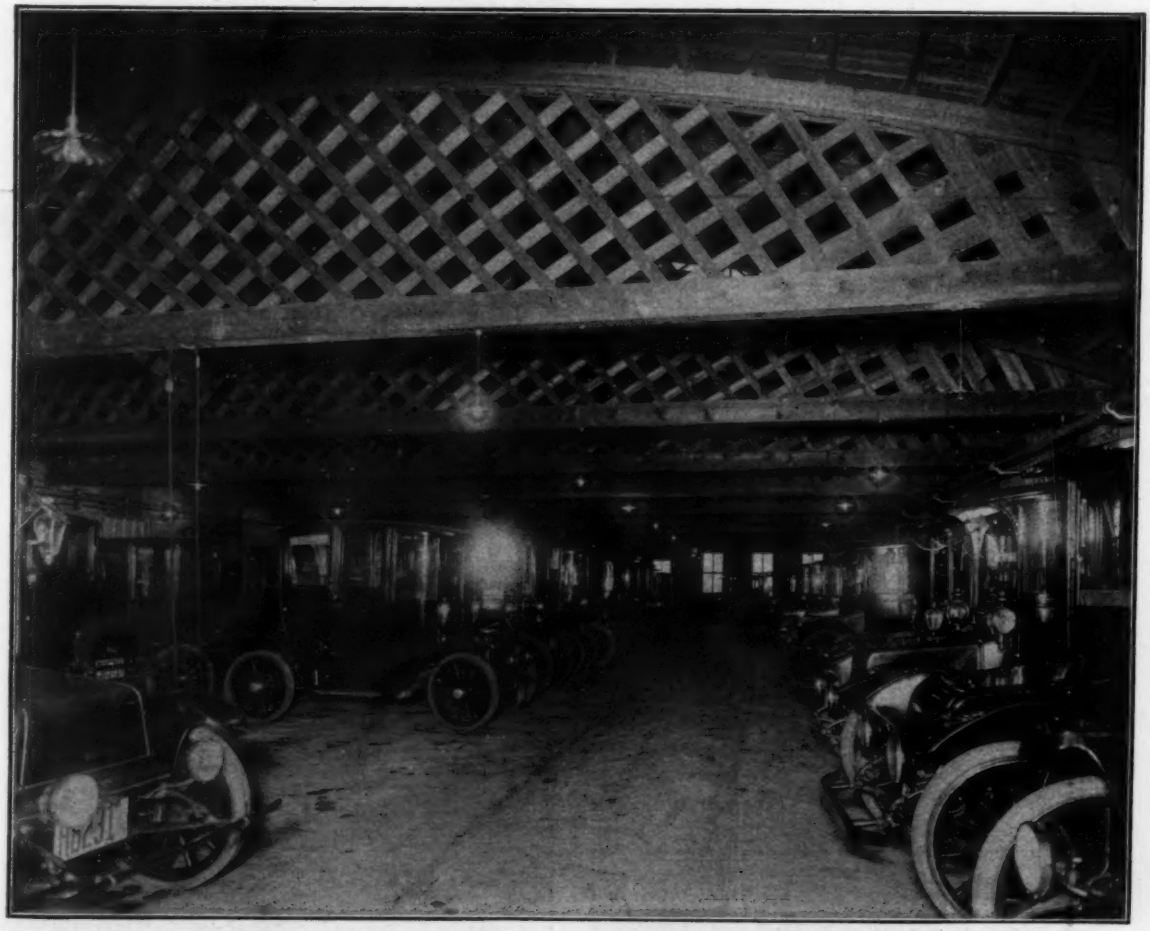


Fig. 1.—Interior of Lake Shore Electric Garage.

All cars are taken care of, including charging and washing, on a monthly basis at rates of from $35 to $40 each. The building is divided into two departments, the main room where the cars are charged, washed and stored; and the repair shop, which includes the battery department. The cars are stalled in three rows, a row against each side wall and a double row in the center. The latter cars receive charging current from cables dropped from outlets supported by the roof trusses; for the cars along the side walls the charging outlets are located about four feet above the floor on the walls. Fig. 2 shows the general scheme of wiring; central-station service, direct current, 110-220 volts, enters from the street subway at the front of the building where the service switch, feeder switches and meters are located.

There are two charging boards located as shown, and four individual charging panels with heavy rheostats for use when charging Edison batteries. In addition there is an individual charging panel in the battery department, which receives current from the lighting mains. The boards in the garage proper are each fed by a three-wire feeder and the four individual panels by one three-wire feeder.

On the south side of the building the charging board has an equipment for 20 circuits consisting of 20 double-pole single-throw circuit switches, 20 charging rheostats, a double-reading ammeter, a voltmeter and a voltmeter switch. A peculiar feature of the rheostats is the provision of a second arm and two extra contacts; when the second arm is thrown over to the second contact the ammeter is thrown into circuit with the car being

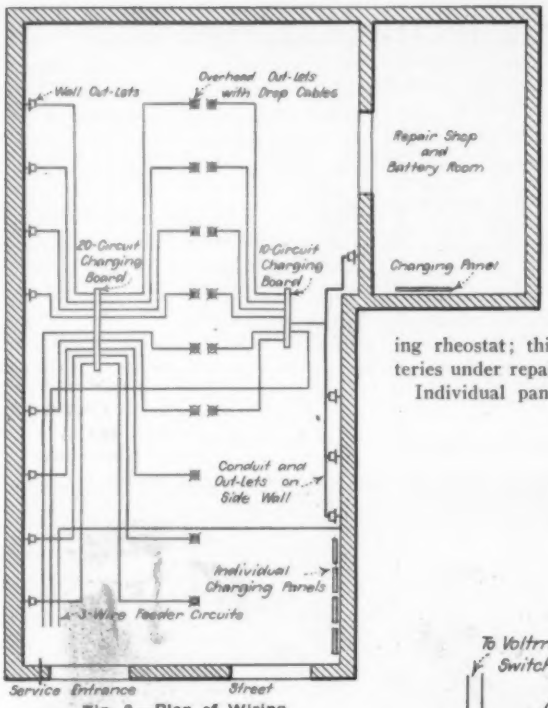


Fig. 2.—Plan of Wiring.

charged. The connections of this arrangement are illustrated diagrammatically in Fig. 3.

The charging board located on the north side of the building has a capacity of ten circuits; the equipment is mounted in vertical rows and consists of a double-pole single-throw switch with fuses; a Reliance ammeter; and a charging rheostat for each circuit. Four charging outlets located near this board are served by feeders in conduits; outside of this construction all other wiring is open and supported by single cleats for large feeders and double cleats for small feeders. The charging panel in the battery department contains a voltmeter and an ammeter, a double-pole switch and a charging rheostat; this is used only for batteries under repair.

Individual panels for the Edison batteries are of two types, one type is equipped with a Weston ammeter, a charging rheostat, double-pole switch and fuses; the other two resemble a motor-starting rheostat in form and have a Jewel ammeter, a double-pole switch with fuses, and rheostat controller mounted on the face plates. A voltmeter panel containing a voltmeter and a voltmeter switch serves the four charging panels just described.

The arrangement of the service entrance and feeder connections is shown in Figs. 5 and 6. A pressed-steel panel box contains the service switch and three feeder switches; a second similar box contains an additional feeder switch. All exposed wiring about the boxes is protected with

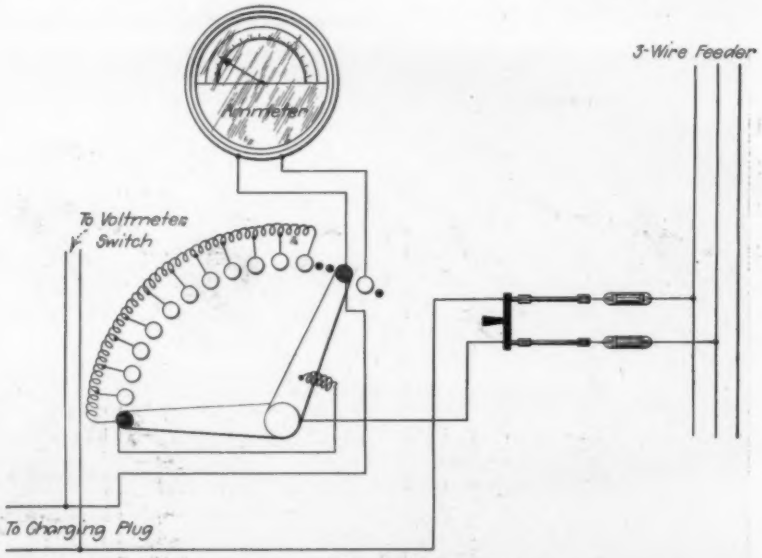


Fig. 3.—Ammeter Connections.

Fig. 4.—Twenty-Circuit Charging Switchboard.

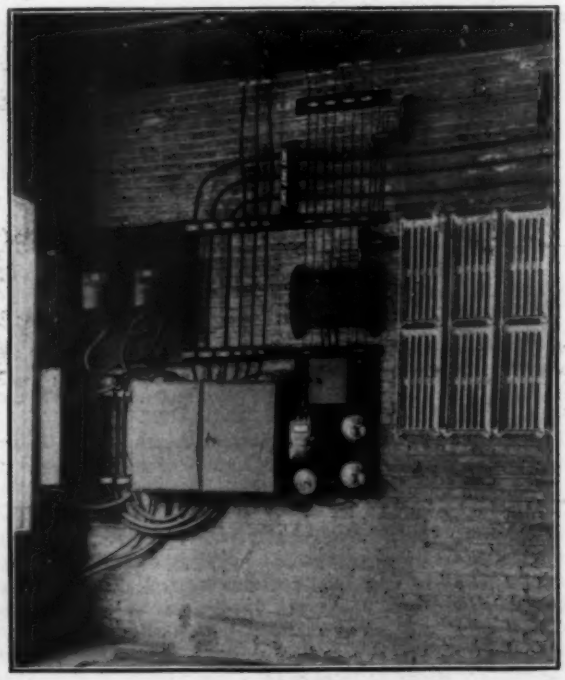


Fig. 5.—Service Entrance.

circular loom, with the exception of service cables, which are lead-covered up to the service switch. A slate panel is located adjacent which contins the lightin-circuit cutout cabinets and a Minerallac Electric Company's contact-making clock, which is connected to two Chicago Electric Meter Company's Printometers that record on a paper tape the consumption of current every 30 minutes.

Fig. 1 shows the arrangement of cars in the garage, and Fig. 8 illustrates the battery-repair room.

Fig. 5 shows the service entrance, switch cabinet, meters, etc.; also the printometer outfit. Fig. 6 shows the wiring diagram of the service entrance and positions of switches and meters.

The rheostat and switchboard for controlling 20 charging circuits on the south side of the room is shown in Fig. 4, while Fig. 7 shows the ten-circuit charging board.

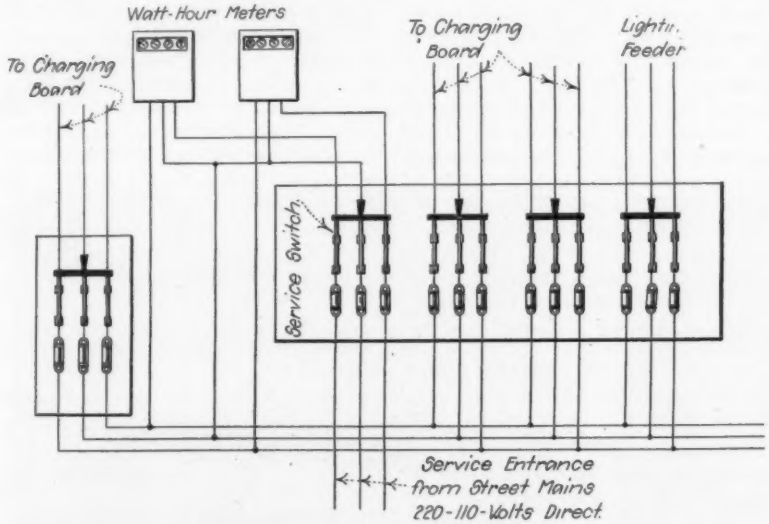


Fig. 6.—Diagram of Service Entrance.

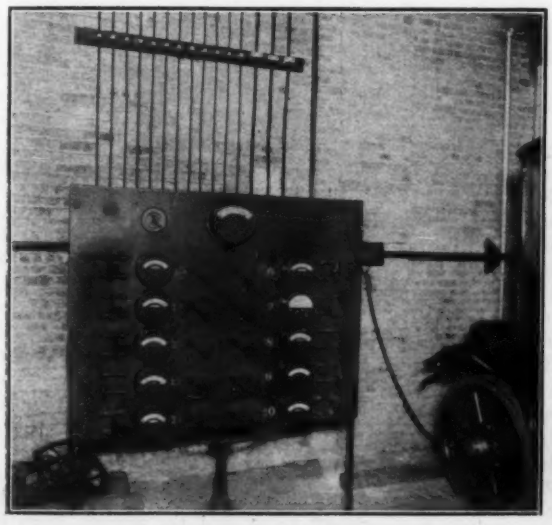


Fig. 7.—Ten-Circuit Charging Switchboard.

Fig. 8.—Corner of Battery Repair Department.

Important Department Store Contract for Boston Edison Company.

The Boston Edison Company has recently made a contract with the R. H. White Company, conducting one of the largest dry goods and clothing stores of the city, by which the latter will be supplied with central-station energy for lighting and elevator operation. Heretofore the White company has operated a private generating plant on the premises, consisting of four steam engines direct-connected to 75-kilowatt generators and one engine direct-connected to a 50-kilowatt generator. The load consists of 7,000 electric lights requiring a service capacity of about 400 horsepower and power equipment requiring about 200 horsepower in motors, the latter being already connected with central-station service.

Engines now operating elevators and blower service for the store's pneumatic system will be done away with and electrical energy substituted.

The change results in the saving of the room which was formerly occupied by the isolated steam plant, measuring 35 feet square, which will be utilized for stock and shipping.

Boston Edison Courtesy Campaign.

The Edison Illuminating Company, of Boston, sends out to every new customer, over the signature of its General Superintendent, William H. Atkins, a typewritten facsimile form letter which reads as follows:

"It is a pleasure to find your name among those recently added to our list of customers.

"The booklet recently sent you, entitled 'Notes and Suggestions in Regard to Edison Service,' shows the variety of ways we seek to meet your needs.

"Although thousands of people are using Edison service, the enjoyment of its facilities by each one is of personal interest to us.

"We expect every employee of our company to strengthen your impression of our courtesy and willingness to serve. They represent the company. You know Edison Service through them.

"We hear many pleasant things about our Edison people, but we also know that misunderstandings arise because of haste, incomplete information, etc. Enclosed you will find a stamped envelope in which to report such occurrences, order appliances, or ask any questions.

"Our motto is: 'Public Service for the Public Comfort.'"

Commercial Practice
Management, Rates, New Business

Electric Vehicle Activity in New York.

In answer to a demand for lists of garages and charging stations, the United Electric Light & Power Company of New York City is distributing such a list of garages and charging stations in the Metropolitan District to the owners of electric vehicles operating in Greater New York and such other owners as request same.

The list is on heavy cardboard and is designed to be tacked firmly in the vehicle in order that the operator may determine at a glance the nearest station for boosting his vehicle when such is required, giving consideration to the current facilities available at the station in question.

The company announces coincidently with the distribution of this charging list a reduction in the minimum monthly charge on the storage-battery rate, from $25 to $10 per month after November 1. This reduction will be welcomed by the owner of a low-capacity truck or passenger car, privately garaged, which does not require enough charging to exceed the present minimum charge at the existing low metered rate.

This reduction of the minimum charge is in conformity with reduction of the storage-battery rate which has taken place from time to time during the past several years, the last being effective May 1, 1914, when a substantial reduction was made in the graduated scale.

Iron Campaign in Boston.

A campaign of four weeks, which ended in September, resulted in the sale, by the Edison Electric Illuminating Company, of Boston, of 2,000 electric flatirons. Little advertising expenditure was involved—merely placards and window displays in the company's 14 appliance stores and also in the shop windows of about 25 electrical contractors whose interest was attracted to the campaign. The campaign was conducted on the lines of presenting the argument of economy to the cautious New England housewife. Old irons of any description, whether gas, kerosene, toy irons, the every-day kind used on kitchen stoves, etc., were bought in at $1.00 each, which seemed to their owners a very good price for something which in most cases cost but 25 or 50 cents.

New electric irons, of the Westinghouse, Simplex, General Electric and Thermax pattern, and of 6 pounds weight, were sold at the regular price of $3.50. The deposits of out-of-date irons, of all sorts and conditions, were displayed in the two-score windows noted, alongside the shiny new electric irons. The drawing power of the forty show window displays is evidenced by the large results of the campaign. These, despite the fact that a house-to-house canvass had preceeded this campaign by only a few weeks.

The Boston Edison Company is now entering upon a like campaign on percolators. A standard appliance is offered for $6.00, the purchaser to bring in a coffee or tea pot, this utensil being credited on the sale at the generous rate of $1.00.

Louisville Gas and Electric Promotes Efficiency.

Saving of half an hour in the time it used to take to get an order for a service connection through the office of the Louisville Gas & Electric Company has already resulted from the series of meetings attended by employees of the company and participated in by them. The first meeting took up for consideration the problems of "Prompt Service Connections" and one of the results was that noted. Donald McDonald, vice-president and general manager of the company, who arranged for the series which will be participated in by men in positions of authority in the various departments, addressed the first meeting, also, on the value of co-operation and on the subject of economies. What one man may save does not mean a great deal, he pointed out, but if every employee in the company could save something each day, the total would be considerable.

Kansas City Light Helps Make Festival a Success.

The opening of Kansas City's six million dollar Union Station was celebrated by a two-day-and-night festival, including a manufacturers' parade, showing Kansas City's industries, a parade of local organizations, banquets and speech making. The station was formally opened to traffic at 12:01 o'clock Sunday morning, November 1. The industrial parade was a striking feature of the celebration, particularly popular because Kansas City has had no such parade for several years. The old Priests of Pallas pageants consisted of floats carried on street car trucks; they were held at night and the floats were brilliantly illuminated. The industrial parade on Friday was held in the morning, and the only electrical feature in it was a display by the Kansas City Electric Light Company, consisting of a miniature breakfast room in which a young man and woman sat at a table well equipped with electrical cooking devices, while nearby glowed an electrical heater. A hurry-up arrangement for lighting two of the big viaducts near the station was made a few days before the opening because the city had been unable to see its way clear to install lights on these viaducts. The Commercial Club contracted with the Electric Light Company to install 80 400-watt tungsten lamps on these structures for the occasion.

Edison Day in Schenectady.

As was fitting, the Schenectady (N. Y.) Illuminating Company celebrated "Edison Day" in a manner that impressed upon the public the significance of Edison's achievements. In addition to the use of billboard posters, blotters, placards upon all company vehicles, special newspaper advertising, and an attractive window display, the company offered for sale on Edison Day, 60-watt Edison Mazda lamps at 15 cents each, this being half the regular price. Between the hours of 8 a. m. and 6 p. m. on that day 10,405 of these lamps were sold to approximately 3,330 customers. Each customer was limited to five lamps at this special price. Placards were posted in the windows and the salesroom reading as follows:

"We especially recommend the use of 60-watt Mazda lamps in the kitchen, the dining room, and the reading lamp in your own home."

It is stated that the reason for selecting the 60-watt lamp for this special sale was the realization that people have become so imbued with the idea that they can save in current consumption by the use of a slightly smaller lamp that they have gradually come to use lamps which are too small for satisfactory illumination.

It is hoped by the Schenectady Illuminating Company that this sale will start a reaction along the line of "more light for the same money."

Co-operation in Portland.

Co-operation between the central station and the local board of trade is evidenced in Portland, Me., where the Cumberland County Power & Light Company conducts an electric shop, on Congress Street, for the sale of electric ranges, lamps and other household appliances. This "shop" is entirely distinct from the company's offices and lamp distributing center, which are two or three blocks away, and the Cumberland County company has rented a corner of the "Electric Shop" to the Portland Board of Trade for its Information Bureau. Here are kept for distribution literature pertaining to the summer resorts about the city, and an attendant is in charge to answer all inquiries. A large cloth sign bearing the words "Information Bureau" spans the street in front of the premises. The close relation that lighting, heating and cooking appliances bear to the summer and other transient trade is recognized, as many people combine requests for information with inspection of the lamps, irons, ranges, motor-driven ice cream freezers, etc., which are displayed in full view of all visitors. The smaller apparatus is exhibited on handsome quartered oak tables ranged on either side of the room, which is lighted by a double line of seven 100-watt tungsten lamps in corrugated glass reflectors. A 500-watt nitrogen-filled lamp lights the exterior of the entrance, and a 1,000-watt unit of the same type sheds a brilliant radiance over the adjacent show-window display.

A campaign has just been completed in Portland for the introduction of household appliances. This has been in charge of the American Sales Company, Boston. A house-to-house canvass has been made by experienced solicitors, and the results have been gratifying. This company guarantees to increase the central stations' sales 25 to 50 per cent, without expenditure for advertising, and works on a percentage.

Information Bureau of Portland Board of Trade and Electric Shop.

Interior of Electric Shop of Cumberland County Power & Light Company.

Central Station Conducts Show-Window Contest.

The second annual window decorating contest conducted by the Empire District Electric Company, Joplin, Mo., is now being arranged. The company has put up a silver loving cup which becomes the property of the firm winning it two years in succession. Last year it was won by the Joplin Hardware Company. The cup will be awarded December 12. Illuminations are becoming more and more a feature of the decorations among the contesting merchants, and it is to stimulate this feature that the contest is held.

Cincinnati Agitates for Municipal Plant.

Anticipations of a higher, rather than a lower, lighting rate for the city of Cincinnati, as a result of the report of the value of the plant and properties of the Union Gas and Electric Company, to be filed shortly by the expert employed for that purpose by the city, have resulted in an organized campaign against possible higher rates by the People's Power League, which has advocated municipal ownership for some time. The organization is headed by Herbert S. Bigelow, and proposes, if lower rates are not provided for in the forthcoming contract with the company, to start a campaign for the construction of a municipal plant, to cost about $3,000,000, to compete with the Union Gas and Electric Company.

Decorative Lighting in Springfield.

A plan for again establishing a "white way" on Commercial Street, Springfield, Mo., is meeting with favor, among the merchants. It is proposed to install 300 20-watt tungsten lamps. There will be a separate meter for each block and the merchants of that block will pay only for the lights used for their particular benefit. These lamps will replace the eight-candlepower lamps previously in service. Unless all the merchants in a block contribute the service will be discontinued in that block.

Arkansas Valley New Business.

During the first nine months of 1914 the Pueblo Division of the Arkansas Valley Railway, Light & Power Company made an increase of 964 kilowatts in connected load, this gain being made up of 462 kilowatts in motors and 502 kilowatts of lighting. This compares with a net gain of 660 horsepower in motors and 501 kilowatts of lighting for the entire year of 1913.

Electrical Construction

DRILLING SLATE AND MARBLE PANELS.

By C. V. Radley.

One would think that because of the frequency with which it is necessary to drill slate and marble in electrical construction, the proper manipulation and tools required would be pretty generally udnerstood. This, however, does not appear to be the case. It is probable that there are only a few shops in the country that are drilling slate and marble by the most economical methods. The holes, that must be made in these materials where they are applied for switchboard panels, may be divided into two general classes: the first comprises the small holes, possibly one-eighth inch in diameter and one-half inch deep, that are drilled in the material and then plugged with lead or wood to form supporting points for wood screws that hold wiring cleats; second, the larger holes that are drilled entirely through the panels to accommodate terminals or conductors that must extend through from face to face.

Strange as it may appear, if two drilling jobs, identical except as to material, one being of slate and the other of cast iron, are compared, it will usually be found that it requires half again as much time to drill the slate as it does the iron. Furthermore, as a general proposition, twice as much metal will be worn from the slate drill as from the iron drill in making a hole of a given diameter and a given depth in the two materials. The drill used in slate will be continually overheating and lose its temper, and will require frequent regrinding.

First, the different types of tools that are used for turning drills for making holes in slate or marble will be considered. A bit brace of the form used by carpenters and other mechanics can be used for small holes—possibly those up to one-half inch in diameter. For larger holes the bit brace is ineffective, because the time and effort required to bore with one of them is out of all proportion to the results obtained. Bit braces fitted with small twist drills can be used to fairly good advantage for drilling the small holes in panels that are used when plugging for switch points or for wiring cleats.

The geared breast drill, which gives a relatively high cutting speed with a comparatively slow turning of the handle, is better than the carpenter's brace for drilling all holes, even the smallest ones. The breast drill is therefore much preferable to the bit brace for making holes for supporting cleats. With both the breast drill and the bit brace there is likely, particularly when

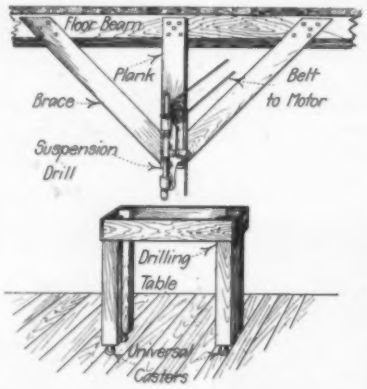


Fig. 1.—Drill Press and Table for Handling Panels.

the holes that are being drilled exceed one-fourth inch in diameter, to be difficulty in retaining the drill that is being turned in accurate alinement. The tendency of the drill, unless it is restrained, is to creep around in the material and make a hole that is approximately funnel shaped, that is, the hole will be of greater diameter at its mouth than it is farther down in the material. Because of this condition, it is necessary, where reasonably accurate work is essential, to adopt some means of rigidly supporting the drill and the

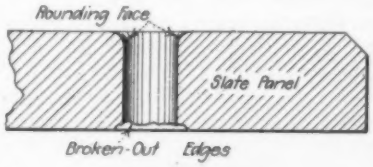


Fig. 2.—Poor Drilling.

panel that is being drilled in a definite relation.

The drilling rig suggested in Fig. 1 maintains a definite relation between the drill and the panel. The drill press, which may be either of the suspension type shown in the illustration, or an ordinary blacksmith's upright drill, is attached to a wood or structural-steel hanger suspended from above, somewhat as suggested in Fig. 1. It is obviously always better to use a power-driven drill where feasible. However, drills actuated by the manual turning of a crank give splendid satisfaction, where there is not a great amount of work to be done. The suspension piece to which the drill is attached should be very substantially braced in at least three directions, so that it cannot vibrate or shift when the tool is in use. For a temporary installation a blacksmith's drill can be purchased for $8.00 or $10.00. Such a drill can be made to pay for itself on a job of any consequence. For maximum economy, such a drill can be driven with a one-horsepower motor. The pulley ratios should be such that the drill point will have a speed of something like 175 revolutions per minute.

Some sort of a table must be provided, upon which the slab or panel to be drilled can be laid, and then pushed to the proper position under the suspended drill. Although a heavy table of any sort will do, one of the type shown in Fig. 1 is preferable. The table illustrated is only a frame one and has no top, hence when drilling through the slab there is no possibility of the drill puncturing the table top. Substantial ball-bearing casters should be set in each of the legs of the table, so that it can be readily and accurately shifted with little effort.

Work has been done with a suspended drill without using a table at all. The panels were in this case laid flat on the floor and the suspended drill mounted on a hanger piece a few inches above the floor.

In laying out on the panel the holes to be drilled, an indelible pencil and a prick punch are the most convenient tools for marking.

A hole not exceeding seven-sixteenths inch in diameter can be made with one drilling. For holes up to seven-eighths inch in diameter, two drillings should be made. For holes up to 1.5 inches in diameter, three drillings are usually required unless a boring tool, described later (Fig. 7), is used. The reasons for drilling a small hole and then a larger one, for holes larger than seven-sixteenths inch in diameter, are two. First, the small or guide hole serves as a guide for the

larger drill. Second, and probably most important, the small hole provides an exit for the slate dust that is cut off when drilling through with a larger drill. The usual practice, when drilling a large hole, is to bore through the panel first with a one-fourth inch drill, unless the ultimate hole is of quite large diameter, in which case a three-eighths inch hole should be first bored, to provide a guide for the boring tool of Fig. 7.

Where no drill press is available, it is necessary to use a bit brace or breast drill for turning the drill point. In such a case, where accurate work is necessary, considerable difficulty will be experienced in making a smooth round hole if an effort is made to put the hole through too quickly. In such cases it is probably best to first bore the hole through with a one-eighth inch drill, then enlarge it with a one-fourth inch drill, and continue enlarging it with different drills by one-fourth inch increments, until the required diameter has

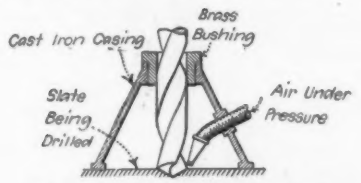


Fig. 3.—Drilling With Air Blast.

been attained. With hand drilling, this is probably not only the most accurate, but it is also the most rapid method. If the operator is careful, the broken-out bottom and the funnel-shaped top (Fig. 2) can be wholly avoided. If an effort is made to put through (without a drill press) a large-diameter hole with one drilling, a funnel-shaped top opening will almost invariably result. If the hole is not entirely circular, it can be trued up with a rat-tail file. If the back edges of the hole have chipped or broken out, the depressions can be filled with plaster of paris.

The difficulties and tool wear encountered in drilling slate are very largely due to the slate dust that is ground off as the drill digs its way into the hole. This dust tends to pack into a hard mass, which wedges under the cutting edges of the drill, and fouls it. It may prevent the drill from turning or even render its withdrawal from the hole difficult. Therefore, one of the most essential problems in drilling slate (or marble either, for that matter) is to get rid of, or avoid, the slate dust. One way of doing this is to first drill the small hole as suggested above through which the dust can drop as the larger follower hole is cut. An air-blast arrangement (Fig. 3) has been tried out for dispersing the slate dust. As suggested in the illustration, a conical casting, having a bushing at its top with a hole in it of the diameter of the drill, is made to fit around the drill and over the hole being bored. Air under pressure is introduced through a tube to the inside of the casting and directed with a metal nozzle into the hole. The blast keeps the hole clean pretty effectively, but it is impossible to make

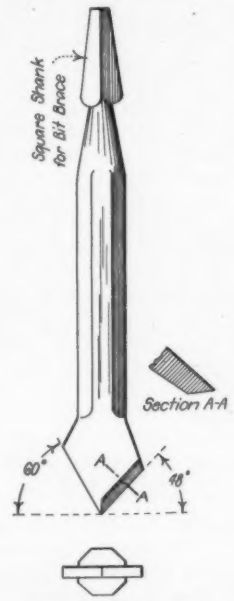


Fig. 4.—Flat Drill.

the casing tight enough so that the slate dust will not be blown out into the atmosphere and interfere with other work. The hole will be kept clean enough so that relatively large holes can be made with one drilling, and without its being necessary for the operator to raise the drill to clear off the slate dust. The air-blast arrangement is, however, rather expensive to install and maintain, and has not, so far as the writer is aware, ever been generally adopted. It has been found that if proper attention is paid to the grinding of the drills, the

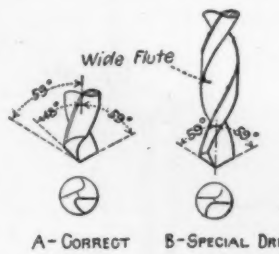


Fig. 5.—Twist Drill.

air blast is unnecessary for economical and effective work.

It is nearly always necessary, in drilling slate, to remove the drill from the hole frequently to clear it of dust which may have caked on the drill. While the drill is out of the hole, it is also a good scheme to take some of the dust out of the hole with a little spoon-shaped tool.

Several forms of drill points can be used for making holes in slate or marble. Only three of the most important ones will be considered here, namely, the flat drill (Fig. 4), the twist drill (Fig. 5), and the special boring tool (Fig. 7).

The flat drill can be used as a sort of makeshift tool. It is not nearly as economical or as easy to handle as the other two drills. It has the advantage, however, that it can be forged by any

Fig. 6.—Notched Twist Drill.

blacksmith from the hexagonal tool-steel stock that is nearly always available. A knowledge of its possibilities is a valuable asset to the construction man who has drilling to do in some out of the way place where twist drills of proper diameters cannot be obtained. In grinding the flat drill, it appears to work better if one cutting edge is ground as shown at 60 degrees and the other cutting edge at about 48 degrees. This grinding appears to promote clearance as described in the following paragraph. Either a round, a taper, or a square shank can be forged on the flat drill to fit the jaws of the chuck that is available.

Twist drills are used more than any other tool for drilling all but the very large holes in slate and marble. Merely because a drill is a twist drill, it must not be assumed that it will work well in these hard materials. It is naturally assumed by a great many mechanics that the same angle of the cutting point, namely, 59 degrees, that is used for metal drills, should, with proper clearance, cut slate and marble as well. If a drill with a 59-degree point is used in slate it will require careful hand feeding and after a few holes have been cut, it will be found that the pulverized slate will form in the flutes of the drill in hard cakes, and that the drill will become very hot.

It has been found that the construc-

tion of the drill and the angles at which its cutting edges are ground have very much to do with its successful operation. It should be noted that even with a properly ground twist drill no method has thus far been discovered whereby the lifting of the drill to clear the hole of dust can be eliminated. (This statement refers particularly to holes that are drilled without a preliminary guide hole having been cut through. Where a guide hole has been cut, the slate dust

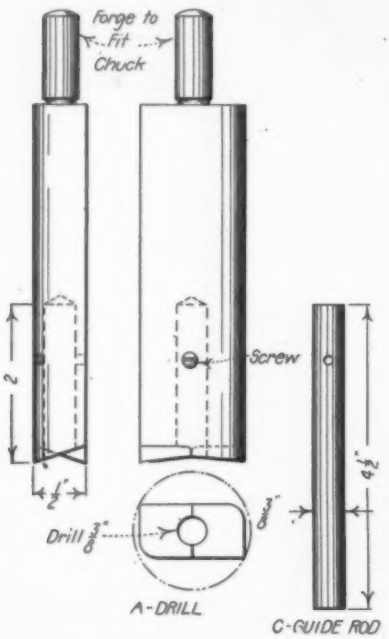


Fig. 7.—Special Boring Tool.

will usually drop out through it, and render it necessary to lift the drill only occasionally or possibly not at all). The ordinary twist drill is usually ground for cast iron and other metals with both cutting edges at an angle of 59 degrees, as shown in Fig. 5, *B*. It has been found that if one of the cutting edges is ground off to an angle of about 48 degrees, as shown in Fig 5, *A*, that the results are decidedly better. This, of course, leaves but one cutting edge on the drill. However, room is provided under the 48-degree edge for the slate dust to slide around, and it prevents the material from binding in the flutes of the drill.

Where a drill is ground with this method, the number of times that it must be lifted out of the hole to clear it will be reduced to a minimum. When the 59-degree edge is worn down so that it is no longer useful, the edge that was ground at 48 degrees can be ground at 59 degrees. The former 59-degree edge is then ground at 48 degrees. This alternating of the cutting and clearing edges continues as the drill length is consumed.

It has been impossible to eliminate hand feeding where holes are being drilled in slate. The operator must be on the alert constantly with his hand on the feeding wheel or lever ready to pull out the drill if it clogs. Furthermore, apparently no method has been discovered that prevents the "burning up" of the cutting edges of drills. The expense of grinding drills, that is, of keeping good edges on them, is one of the important factors in the cost of drilling slate. Drills of high-speed steel have been tried for slate and marble,

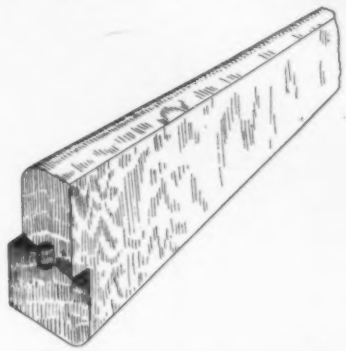


Fig. 8.—Showing Shape to Which End of Tool is Ground.

but it appears that they have not been particularly successful. Too much speed seems to burn these drills just the same as it does those made of other steels.

Another advantage of grinding one of the cutting edges of a drill to an angle less than 59 degrees is that it prevents

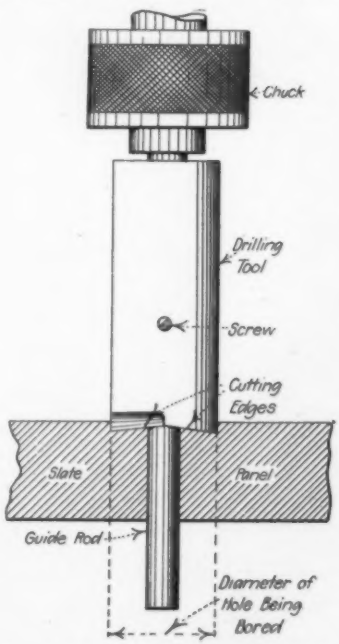


Fig. 9.—Use of Special Boring Tool.

chipping out at the face of the hole where the drill comes through (Fig. 2). This chipping can be effectively prevented by a careful operator if he feeds slowly and carefully as the hole is being finished. He can put on the feed as strong as he dares until the hole is almost through. Then he must proceed cautiously and carefully. Wherever the drill point is ground to about 48 degrees even a heavy pressure will not crack out the slate and the edges of the hole will be smooth and clean. It has been found that this angle should never be less than 48 degrees for most effective work.

The drill manufacturers have appre-

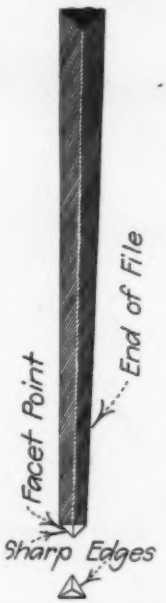


Fig. 10.—File Prepared for Drilling Glass.

ciated the demand for a drill that would clear itself effectively and work rapidly in slate, and have endeavored to produce designs especially suited for this service. The drill shown at Fig. 5, *B*, was designed with this end in view. The flutes in it are 1.5 times wider than those in the ordinary twist drill, to provide plenty of room in which the slate dust can rise. This drill has been tried out in several instances in practical work, and has been found very much better than the ordinary drill. The drill with the wide flutes (Fig. 5, *B*) is obviously much weaker than the standard twist drill for metal, because of the considerable amount of material that is removed to provide the wide flutes. It is amply strong enough, because the thrust and torsional stresses imposed on it are very much smaller than those imposed on twist drills for metal.

Another method of grinding a twist-drill point is shown in Fig. 6. This has never been given a trial by the writer, but it appears that it ought to work out satisfactorily. Where this grinding is used a guide hole and a follower hole are drilled. Two one-fourth-inch twist drills for the guide holes are required. One of these drills has its point ground to the standard angles shown in Fig.

5, *A*. The other has a V-shaped notch cut out of its end as shown in Fig. 6. A one-fourth-inch guide hole is started with a standard-ground one-fourth-inch drill. After the standard drill has punctured the slate far enough that its point is hidden, it is withdrawn. The guide hole is then completed with a one-fourth-inch drill ground as shown in Fig. 6. Then the larger follower drill is fed through, the pulverized slate produced by it falling through the guide hole, providing ample clearance for the larger drill.

Where very large holes, say 1.5 inches in diameter, are to be drilled in slate or marble, twist drills can no longer be used conveniently. For this service, the special boring tool, which is not a commercial product and which must be made for each man by himself, is a very satisfactory device. Fig. 9 shows it in operation. To use it, a guide hole, three-eighths inch in diameter, is first bored at the indicated point. Then the guide rod of the boring tool is inserted through this hole, and maintains the boring tool in correct and rigid alinement while the hole is being completed. The drill portion of the tool (Fig. 7, *A*) is forged from tool steel, with a shank to fit the chuck of the drill press available. The stock from which the drill is forged should be of rectangular section about one-half inch thick, and of a width such that it will produce the hole diameter required. The guide-rod hole should be bored accurately in the center of the drill, about 2 inches deep, and a hole for a one-fourth-inch filister-head screw should be made in both the drill and the guide rod, to hold the guide rod in position. The point of the tool is ground as suggested in Fig. 8, and Fig. 9 gives an idea as to how it goes into the slate. This tool is particularly useful where it is necessary to avoid creepage. For instance, it may be required to bore a hole so that it intersects another one. With the tool shown this can be effected very nicely. It cannot usually be done with an ordinary tool that has no guide rod to prevent creeping.

Slate or marble should always be lubricated with water as holes are being drilled. Plenty of water should be furnished. In certain cases it has even been the practice to keep a stream of running water playing into the hole and on to the drill. This keeps the slate dust washed out of the hole, and keeps the drill cool. The use of a diluted solution of ammonia in water is suggested as a lubricant for drilling in slate. It is claimed that this liquid will make the drill take hold and cut very rapidly.

It is sometimes necessary for the electrical man to bore small holes through glass. This can be done with little difficulty if the proper tools are provided. Probably the easiest method of making a hole in glass is to use an old file for a drill, and turpentine or water for a lubricant or wash. Turpentine is considerably better than water. To make the file-drill, break the end from an old three-cornered file and grind it down to a facet point as shown in Fig. 10. Whet the three faces on an oil stone until the edges are very sharp. Lay the glass to be drilled on a horizontal surface with a pad of blotting or newspapers under it to prevent breakage due to a nonuniform distribution of pressure. Then dip the file in the turpentine and hold it perpendicular to the glass. Exert some pressure and turn the file, which should have a wooden handle, with a slow rotary motion. Apply plenty of turpentine to the point of the drill with a feather. The hard outer surface of the glass will soon be pierced and the drill will pass rapidly into the softer inner glass. When the point of the drill appears to be nearly through the glass, turn it over and complete the hole by boring from the opposite side.

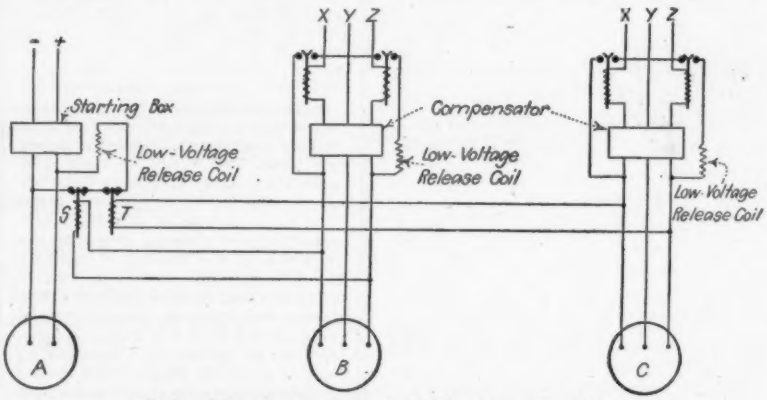
A broken-off twist drill, tempered glass hard, by heating it to a cherry red and then plunging it into a block of sealing wax, can be used for drilling glass. Such a drill can be turned in a carpenter's bit brace or in a breast drill. Any drill that is used for glass must be kept very sharp.

Motor Control.

In operating a coal crusher and two coal conveyors, it is important that the conveyor feeding the crusher should be stopped in case either the crusher or the conveyor, which takes the coal away, ceases to operate. The following arrangement is consequently of value in achieving this purpose.

In the installation referred to, the conveyor which feeds coal to the crusher is a 10-horsepower continuous-current motor, indicated by A in the accompanying diagram. Motor B is a 35-horsepower alternating-current motor which operates the conveyor taking the coal away. Motor C operates the coal crusher, has a capacity of 50 horsepower and operates on alternating current. B and C are equipped with starting compensators. A is equipped with a starting box having a low-voltage-release coil, in which circuit two alternating-current relays, S and T, are connected. S is connected across one phase of motor B between the motor and the compensator, and T is similarly connected in the circuit of motor C. The relays S and T are designed to be closed under normal operation. Failure of voltage on either B or C and their consequent stopping will actuate S or T, open the low-voltage circuit of A and consequently stop the direct-current motor.

Glenn W. Smiley.



Wiring Diagram for Control of Direct-Current Motor.

Among the Contractors.

E. N. Peak and E. J. Clark, formerly with McCarten Plumbing Company, Marshalltown, Iowa, have started an electrical contracting business in that city. The firm name is Marshall Electric Company, and headquarters will be in the Iowa Savings Bank Building. Supplies and motors will be carried in stock and a general merchandising and contracting business conducted.

W. J. Collins, who has acted as secretary of the Faraday Electrical Association, Chicago, almost from its first organization about four years ago, has joined the Humboldt Electrical Construction Company, with headquarters at 2205 North California Avenue, in that city. The members of the Faraday Association have decided to discontinue a separate organization, and have consolidated with the Electrical Contractors' Association of the City of Chicago.

Young & North, of Columbia City, Ind., have begun the electrical installation in the new 25-loom mill of the Columbia Woolen Mill Company. The electrical contract provides for wiring the entire mill for lighting and power. Thirty-five motors, ranging from one to thirty horsepower, are being installed.

National Association of Electrical Inspectors.

THOMAS HENRY DAY, President, 59 Deerfield Avenue, Hartford, Conn.
H. S. WYNKOOP, Vice-President, Municipal Building, New York, N. Y.
WILLIAM LINCOLN SMITH, Secretary and Treasurer, Concord, Mass.
JAMES E. COLE, Representative on Electrical Committee of National Fire Protection Association, City Hall Annex, Boston, Mass.

Executive Committee
EUGENE N. DAVIS, Chairman, Brookline, Mass.

SECTION REPRESENTATIVES:
C. H. Fletcher, H. Burnes, British Columbia.
A. W. Hopkins, G. W. Perry, Western New England.
Washington Devereux, A. H. Lilley, Philadelphia.
E. N. Davis, H. A. Knight, Eastern Massachusetts.
C. A. Hannan, O. E. Smith, New York City.
C. W. Mitchell, John W. Carrell, California.

MEMBERS AT LARGE:
George L. Collison, Frank R. Daniel, James H. Fenton, F. G. Hartwell, J. E. Latta, James B. McCarthy, Thomas D. MacColl, A. A. Moffitt, R. P. Strong

"LET THE CODE DECIDE."

Secretary's Message.

The Eastern Massachusetts and Western New England Sections have held their first meetings of the season and though no word has reached the Secretary's office, he hopes the others have also. The meeting of the first mentioned (no detailed account of the meeting of the second has come to hand) was largely attended and very helpful. It was mostly devoted to fraternal greetings after the summer recess and discussion of the innumerable little things which had been observed during the period.

The second meeting will be held early in November, the stated subject for discussion being the advisability of a rule allowing the use of cabled wires for service loops from pole lines to building entrances.

It should also be stated here that it is required that any member having any changes to suggest in Code rules should present them at this meeting so that they may be put through the constitutional procedure to make them Association matter.

The constitutional requirements is that any Section shall discuss any changes suggested by its members, and if deemed advisable formally vote to approve them; then the secretary is to forward them certified to this office, whereupon the general secretary will transmit them for approval to the Executive Committee and if approved by a plurality of that body they are sent to the secretary of the Electrical Committee to be printed in the bulletin he sends out in January. In this way they are made formally Association matter which its delegates are to take charge of as such.

Any member at large having a proposal to make may send it directly to this office, when it will similarly be sent to the Executive Committee.

This process takes time but is intended to ensure that only reasonable suggestions go through as formal Association proposals. The whole process, however, must be done in two months, so members will please see to it at once.

Copies of Mr. Sweetland's bulletin will be sent our members when it is issued and all matters which it is thought wise should be taken up definitely either for or against will be settled at our convention in New York; any *member at large* unable to attend may send me beforehand his vote upon any item in the bulletin and it will be recorded when the said item is put before the convention.

During the past two weeks tentative lists of membership have been prepared and by this time should be in the hands of every member; this is preliminary to a more detailed list which it is intended to have printed in January. If any member desires a change, to have his business position stated, or finds his address incorrect, please notify me at once, giving the exact way you desire to have the address appear. With this membership list the bill for dues for the current year was also sent out. The secretary trusts the members will not take it amiss if he says in large type "Please send this small amount at once." Do it now because there will be quite a few expenses to meet between now and convention time. If members far west will kindly send stamps or money order it will save collection charges on many small checks which ultimately foot up to considerable.

Of the questions appearing in this number, Question 279 is easily the most important and timely just at this season. It is obvious that a spirit of questioning is in the air which, I suspect, might be more pronounced were it not for our regulations governing replies. When three replies come in like B, P, and R, from members whom we all hold in the very highest estimation (albeit they are veiled prophets under our rules) it would appear to indicate a doubt as to the wisdom of the regulation, as to which, however, as it stands, I feel there can be no mistake.

I wonder if it is not one of those cases which Mr. Powell Evans has so frequently referred to in the National Fire Protection Association meetings somewhat emphatically, which are so easy to put in a Code and so practically impossible to enforce, and which therefore tend to bring the enforcement of the whole Code into enfeeblement.

In a certain municipality which shall be nameless the municipal fathers established a regulation that in garages no open light should under any conditions be permitted less than four feet above the floor. Fortunately the new regulations were shown to one of our Executive Committee members (who told me about it) and he criticized this point, saying that probably it had been forgotten that pretty nearly every man with an automobile stooped over, scratched a match on the seat of his pants and lit the tail light therewith; did they propose that every machine must be jacked up till the tail light was four feet off the floor?

The matter appearing in this section consists of questions on the National Electrical Code, its interpretation and meaning, and questions as to whether certain methods of wiring are in accord therewith. These questions are gladly received from anyone interested, even if not a member; they should be sent to the secretary with any needed elucidating sketch. They are answered by each member of the Executive Committee according to his knowledge of what the ruling would be in his jurisdiction.

It should be understood that no pretense is made to give an authoritative interpretation of the Code. This is a voluntary association; it has representation on the Electrical Committee of the National Fire Protection Association, which prepares the Code, but it has no right, and claims no right, to give a final interpretation of anything in the Code. It is only intended to give the interpretation which seems correct to the members of the Executive Committee. No attempt is made to edit or correlate the answers from the different members of the Committee, as it is felt that the occasional difference of opinion is calculated to lead to a further study of the matter in question, further discussion and the final clearing up of obscure points.

The aim is to help toward a better understanding of the Code on the part of all; a more uniform conception of its meaning; increased precision in applying it; and harmonious action of those using it, for the common good.

Such a regulation is practically unenforceable because it requires just about as many watchmen as there are machines. It illustrates, however, the proneness of Americans to put innumerable things into by-laws which cannot be enforced and which thereby weaken the authority of those that can be.

It would appear to the secretary that this very matter of Question 279 is an excellent one for Section discussion and possible action, as has been referred to in the earlier part of this message.

Slate Backing for Sign Transformers.

Question 277. Does the Code require a slate backing on sign transformers, reducing voltage 125 to 12, on either the indoor or outdoor type of transformer?

Answer 1(O). Rule 36*c* would seem to cover this question and would require a slate backing for transformers, other than for bell ringing and signaling use, where transformers are mounted against combustible material.

Answer 2(D). Slate backing would not be required unless the clearance between transformer and combustible material is less than one foot.

Answer 3(Y). This department allows these transformers only when installed in approved cabinets, except when of an outdoor type, and these are fastened to the outside wall of the building.

Answer 4(B). As transformer referred to in this question is for sign-lighting purposes, it must be installed at least one foot from combustible material, unless separated therefrom by some non-combustible non-absorptive insulating material as specified in Rule 36*c*. The only exception to this requirement in so far as transformers are concerned is for bell ringing and other signalling transformers, the wattage of which is limited.

Answer 5(P). Rule 36*c* very clearly requires a slate backing for a sign transformer unless mounted one foot from combustible material. While this requirement appears under class C, it would be the crudest kind of a technicality to waive the requirement if the sign transformer were mounted directly on the wood front of the building.

Answer 6(S). Yes. See Rule 36*c*. No particular type of transformer is assumed in this rule.

Answer 7(Q). The Code requires such a backing unless the transformer is over 12 inches from combustible material. Material used should be selected and proportioned to weight of transformer. In cases where a retardent is necessary, asbestos is preferable to slate, marble or soapstone and is always recommended.

Answer 8(H). Yes, except where the transformer is one foot from the building as provided in Rule 36*c*.

Answer 9(E). The answer is clear, I think, in section *c* of Rule 36.

Answer 10(F). The Code clearly requires that sign transformers shall be treated as sources of heat and therefore must be mounted on slate or marble or removed one foot from combustible material.

Answer 11(A). Nothing in the Code specifically relates to sign transformers. I do not see why these should be mounted on slate any more than bell-ringing transformers.

Answer 12(U). I think this case is governed by Rule 36*c* very plainly.

Answer 13(R). Yes, see Rule 36*c*; except when approved for use under Rule 85*p*.

Answer 14(M). Yes, unless mounted one foot from combustible material.

Answer 15(N). Yes, under Rule 36*c*.

Conduit Fittings for High-Potential Work.

Question 278. In high-potential work, on exposed ends of conduits, must conduit be supplied with fittings that have a separately bushed hole for each conductor?

Answer 1(O). Pot-heads or the approved equivalents should be used where high-potential wires are brought from the conduit. I should judge that a fitting which did not provide separately bushed holes and also for sealing the conductors where they emerge from lead sheath would certainly not be the equivalent of a pot-head.

Answer 2(D) Pot-heads or equivalent approved outlet terminals should be used.

Answer 3(Y). Yes, they should. This department compels the use of pot-heads for voltages of over 550.

Answer 4(P). Rules 8*b* and 28*d* clearly require separately bushed holes for each high-potential conductor unless special permission to do otherwise is granted. The special permission must be given in a great many cases, particularly where a hardwood split block boiled in paraffine is wedged into the end of the conduit.

Answer 5(S). See Rule 8*b*. This states that the conduit work must conform to the rules for interior conduits except that at outlets approved conduit bushings shall be used. See Rule 44*b*.

Answer 6(Q). In high-potential work exposed ends of conduit should be provided with pot-heads. Ordinary fitting with separately bushed holes is not considered sufficient, the bushing being too easily broken and not substantial enough for high-potential wires.

Answer 7(H). Yes; pot-heads or equivalent.

Answer 8(N). In high-potential interior work you cannot conceal wiring except for motors under Rule 8*b* (or in certain cases where inspection department may specifically require concealment in conduit). See Rule 44.

In cases where they are inclosed, I should require a pot-head or equivalent under Rule 8*b* even if the load were something other than motor.

Answer 9(E). In high-potential work a terminal fitting which has a separately bushed hole for each conductor is not required. In Rule 8 in the latter part of paragraph 2 of Section *b* is a departure from Rule 28 inasmuch as we find "except that at outlets approved outlet bushings shall be used."

Answer 10(F). Rule 8*b* contains special instructions for installing motors which may well be called high-potential and requires that the conduit shall be bushed where lead-armored cable leaves conduit. This is best means of protecting lead sheath. Locknuts and bushings as used in outlet boxes ordinarily used on conduit ends have not as smooth an edge as the approved bushing required on conduit containing high-potential cables.

Answer 11(A). Yes, as I read the Code, in those cases where conduit is used at all.

Answer 12(M). No, unless the separately bushed holes are part of an approved form of pot-head or equivalent. The meaning of Rules 44*b* and 8*b* are unmistakable.

Answer 13(U). According to the Rule they are required.

Answer 14(R). According to the Code high-potential wires must be open, except for motor; or if required, closed in. Then a pot-head must be used.

Answer 15(B). In high-potential work within buildings, section *b* of Rule 44 relating to high-potential systems specifically states:

"Must be always in plain sight and never encased except as provided for in No. 8*b* or where specially required."

This eliminates conduit construction, with the exception as noted. By referring to No. 8*b*, it will be seen that this refers specifically to wiring for motors operating at a potential between 550 and 3,500 volts. This rule definitely states that the construction and installation of the conduit must conform to rules for interior conduits, the only exception to the above being in connection with outlet requirements where approved outlet bushings are called for instead of outlet boxes, as provided for in Rule 28 relating to interior conduits.

On page 15 of the National Electrical Code, reference is made to the method in which wires may emerge at outlets, the rule stating:

"The insulation of the several conductors for high-potential motors where leaving the metal sheath at outlets must be thoroughly protected from moisture and mechanical injury. This may be accomplished by means of a pot-head or some equivalent method.

Flexible Cord in Show Windows.

Question 279. Is the prohibition against flexible cord in show windows in Rule 32e intended to apply to the permanent lighting only or also to temporary displays of portable lamps, flat-irons and other electrical devices? If one carries clearly in mind the distinction between pendant and portable cord, will the answer be different?

Answer 1(U). Rules 32*e* prohibits the use of flexible cord for either permanent or temporary use.

Answer 2(T). Rule 32*e* is at present construed to mean just as it reads, with no leeway as to what constitutes a show window or for what use the cord is put there.

Answer 3(B). Rule 32*e* is primarily intended to refer to permanent construction, temporary displays in my judgment being subject to the judgment of the department having jurisdiction.

Answer 4(F). Flexible armored cord is the only type of cord permitted for any purpose in show windows under the code ruling (chain fixtures excepted, if special permission be given).

Answer 5(P). I believe the original purpose which led to the establishment of Rule 32*e* was to prohibit the use of flexible-cord pendants in show windows. The rule is quite generally interpreted to mean that no flexible cord, even if of the portable type, shall be permitted in show windows. As so interpreted the rule is difficult of enforcement, as it is not always practicable to employ armored cord, and portable devices must and will be exhibited. The development of the art has evidently outgrown the rule and I would be glad to see an amendment which prohibited flexible cord for the permanent wiring but authorized a high-grade portable cord for the special temporary displays.

Answer 6(H). The prohibition against flexible cord in Rule 32*e* applies, I think, to temporary as well as permanent installations. Flexible cord, I understand, applies to what the questioner calls pendant cord. Portable cord, on the other hand, or cable should be used for window decorations if properly fused.

Answer 7(E). Flexible cord should never be used for show windows unless it has a metal armor (except in case of chain fixtures by special permission only). The fact that the cord may be of pendant or portable type is no part of the rule.

Answer 8(R). Rule presumably deals with permanent work (e.g., reference to chain fixtures in it). Temporary displays of portable irons, lamps, etc., are allowed if the cord approved for use with them in each case is used and connected by means of attachment plug to the permanent circuit. No splices nor other temporary connection are permitted.

Answer 9(V). Rule 32*e* makes no exception whatever; the cord must be armored. In my territory cords on portables are wound on the stem of the portable and fed with an armored cord extension and passed by my department.

Answer 10(A). Rule 32*e*, I should say, applied to all whether permanent or temporary in show windows, pendant and portable the same.

Answer 11(S). Rule 32*e* is for all cords, type C or any other, as the rule reads. I should not allow any cord used other than armored, except for chain fixtures.

Answer 12(O). Rule 32*e* prohibits flexible cord other than steel-armored in any show windows or show cases and makes no distinction whatever between permanent wiring and temporary or display wiring.

Answer 13(N). Rule 32*e* in my opinion covers absolutely both permanent and temporary wiring in show windows and cases.

Rules 32 says in italics "(For construction of flexible cord see No. 54)."

Rule 54 says in italics "Cords for pendant lamps and for portable use, including elevator lighting and control cables, and theater stage and border light cable."

There is not the slightest chance for any distinction between the "pendant" and "portable" cord. It is armored cord and nothing else except for chain fixtures by special permission.

Among the Supply Men

Western Electric Window Display.

The latest window display of the Western Electric Company's Cincinnati store, which always has something new and interesting to offer in this line, is one of the best of the long series which has been shown. It is devoted to the "Inter-Phone," for use on office buzzer lines, manufactured by the company, and shows graphically the convenience of the device, as compared with the ordinary buzzer. From the front is seen the operation of two offices, one using the old-fashioned buzzer and the other the "Inter-Phone," in a two-story arrangement. The two managers' offices are at one side, one beneath the other, while the desks of the two office boys are at the other side of the scene, also one beneath the other. When the buzzer rings the old-fashioned boy, who, like the other figures, is represented by a bulb painted black, with features in white, and legs of wire, is shown leaving his desk and passing down the hall, his progress behind the scene being indicated by a light flashing in succession at each of a number of paper-covered openings, until he appears in the manager's door. Changing cards, shaped like the arms of a windmill, appears in an opening in the center of the display, explaining the ac-

tion of the figures, and pointing out that while the old-fashioned boy is answering the buzzer, to find out what is wanted, then going to carry out his orders, the up-to-date manager, by the use of the telephone on his buzzer line, gives his order direct and saves just that much time. This is all shown in the action of the two office boys, which with the movement of the wheel carrying the explanatory cards, the sounding of the buzzer and so forth, are operated by an ordinary sign flasher, properly timed.

The display has occasioned more interest and amusement than any which the company has used for some time, and the graphic manner in which it shows the convenience of the device has resulted in plenty of inquiries followed by orders.

Public Service Commissions

Conducted by William J. Norton

CALIFORNIA.

The Sonoma Valley Water, Light and Power Company was authorized to pledge its bonds in a sum not to exceed $30,000 as collateral for a $15,000 loan, which shall be made at a rate of interest not to exceed eight per cent and for a period not exceeding six months.

The company has also been granted an extension of time in which it may issue $30,000 of its six-per-cent bonds from October 1, 1914, to December 31, 1914.

The Holton Power Company was authorized to issue $200,000 face value of its six-per-cent first and refunding-mortgage gold bonds at not less than 80 and accrued interest, the proceeds to be used for various additions and betterments to its plant.

INDIANA.

Court Decision. The Marion County Circuit Court has decided in favor of the Merchants Heat and Light Company in the appeal of that company from the decision of the Public Service Commission refusing to allow the $28,000 bond issue. The Commission authorized the issue of $75,000 worth of bonds but denied the right to issue an additional $28,000, which was to be used for the purpose of reimbursing the company for money expended in extending its street lighting service, in duplication of similar property now in operation by the Indianapolis Light and Heat Company, present holder of the city lighting contract and unsuccessful bidder for the contract for the ensuing ten years. The decision of the court has an important bearing upon the standing of the two companies, the Merchants Company and the Indianapolis Company, in the conflict over the street-lighting contract.

The opinion of Judge Remster follows, in part:

"I don't believe that it is necessary in this case to decide whether the Public Service Commission has or has not discretion in the issuing of certificates to permit indebtedness to a public utility. It may be conceded without deciding that the Commission has discretion whether it will grant or withhold its certificates. If it does see fit to withhold its certificates it would seem the discretion can not be inquired into in a mandamus. But, on the other hand, if it determines every preliminary fact necessary to the granting of a certificate in favor of the issuing of a certificate, then I am impressed that it may be required to take the next step and perform the legal duty of issuing the certificate.

"In this case, the Commission has determined every preliminary fact in favor of the issuing of the certificate. In other words, it found that the relator, Heat and Light Company, had omplied with the provisions of the act. This left nothing to be done on the part of the Commission but to perform its legal duty, namely, to issue a certificate."

In regard to the Commission's objection that the part of the money in question was used to provide for duplication of the street lighting plant, the court says: "In my judgment as applied to the facts in this case, it furnishes no excuse for not issuing the certificate. In my judgment the Legislature has not authorized a refusal on this ground. The only express power granted in this respect is with reference to putting in a new plant in municipalities where one sufficiently adequate to supply the needs of the community is already in existence."

However, the court says: "If the Commission has the power, and can, by reason of the power, force both companies to use the same street plant in the performance of the service, then the rate could be lowered."

KANSAS.

Kickapoo Telephone Company. One of the company's subscribers at Potter provided his own telephone equipment which was connected to the Kickapoo telephone exchange. The Commission finds that the company has in operation a clear line between Potter and the Kickapoo exchange over which all patrons may receive efficient and satisfactory service. The Commission does not approve of the practice of allowing patrons to install their own equipment. There was no necessity for the private installation in this instance and the patron's service is ordered disconnected.

NEW YORK.—First District.

The Annual Report for 1912, Vol. III, has been issued, giving statistics for gas and electric companies. Abstracts of the returns from these companies are given and the data are tabulated and compared with the statistics of previous years. One of the comparative tables shows that revenues from sales of electricity have been increasing at a decreasing rate while consumption has been increasing at a markedly increasing rate. A large increase in the number of consumers is also noted. "The rapid growth in the number of consumers of electricity is doubtless due mainly to an increasingly high standard of living. Since in 1912 consumers of electricity were still not much more than one-seventh as numerous as consumers of gas, it is obvious that there is plenty of room for expansion in the use of the more desirable illuminant. . . . It is remarkable that in the face of the growing use of electricity, the consumption of gas in the city still maintains a rate of increase probably somewhat greater than the increase of population."

OHIO.

The Sunnyside Electric Company was authorized to purchase the franchises and property of the Belmont Electric Company for a consideration of $5,000, and of the Barnesville Gas and Electric Light Company for $70,000, the prices agreed upon by the parties to the sale.

The Manufacturers' Light and Heat Company was granted authority to take over the property of the companies in which it owns all the capital stock. The companies acquired are to be terminated and their stock, amounting to $4,050,000 destroyed. The companies are the Tri-State Gas Company, The Ohio Valley Gas Company, the Wheeling Natural Gas Company and the Wetzel Gas Company.

PENNSYLVANIA.

Telephone Rate Hearings. Hearings on the objections of the telephone companies to the schedule of telephone rates proposed for the whole state will be resumed by the Public Service Commission, and it is expected to close the case within the next 60 days.

WISCONSIN.

Oshkosh Water Works Company, Court Case. The decision by the Railroad Commission fixing the purchase price of the property of the Oshkosh Water Works Company, for the taking over of the water works by the city, has been affirmed in the Dane County Circuit Court. The court finds that the amount awarded by the Commission was a fair compensation and that the terms and conditions of the sale were reasonable.

On the subject of taxes the court says that these were fixed against the plant as personal property as of the date May 1; that the company continued to manage the plant and collect the income up to the following October; that after that date the company received interest on the amount of the purchase price, and that "it ought to pay the tax assessed against its property."

"As to the provision of the bond with reference to the amount of premium," continued the opinion, "if the company is under obligation to pay this premium, it arises out of its contract with its bondholders which was in force at the time that the company elected to accept the indeterminate permit. . . . The value of the plant is not affected by the fact that the company may have agreed to pay a premium for its money, any more than it would be if the company could discount the payment of its bonds for cash because of the present state of the money market."

On the subject of going value, the court says that this was fully considered, and that the ruling of the commission will stand. "We must constantly keep in mind the fact that just compensation is not found by adding up separate items," says the court, "but by taking a comprehensive view of the whole property, tangible and intangible. It appears the commission carefully weighed all the various factors or elements of value which should be considered in fixing just compensation."

Farmers Union Telephone Company vs. Mt. Vernon Telephone Company. The petition desires the Commission to require physical connection between the companies, providing for free toll service. The respondent company objects to free toll service and "in this matter it is within its rights, such gratuitous service being rendered by many small companies only as an accommodation to the community." The service can be rendered over the lines of the Wisconsin Telephone Company at the established toll rates. "Under the circumstances, it appears that the application must be dismissed. The question raised has not been one of public necessity but of the public necessity for free service, and in this case the Commission is unable to rule in favor of a physical connection under these conditions."

The Glidden Telephone Company was authorized to increase rates in order to provide for the added cost of night service which the company is to install at the request of its subscribers.

The Sheboygan Gas Light Company was authorized to issue $50,000 of preferred stock and $300,000 of bonds, $250,000 of the bond issue to be used for refunding purposes and $50,000 for certain extensions and improvements now in progress. The proceeds from the stock, which is to be sold for money only, will be used in paying off outstanding indebtedness incurred for purposes properly chargeable to capital account.

The Eastern Wisconsin Telephone Company was granted authority to issue $17,500 of stock for the purpose of bringing the total of the outstanding stock, bonds, and notes, and other evidences of indebtedness more nearly in equality with the value of the company's property. The issue is to be distributed, share for share to the present stockholders of the company.

The Wheeler Telephone Company was authorized to issue $5,000 of stock, $3,380 of which is to be used in building extensions to the company's present property, and the balance of $1,620 is to be exchanged for 37.5 shares of the Knapp Telephone Company stock.

The LaCross Telephone Company. The Commission has authorized the company to issue $11,150 of preferred stock, for the purpose of obtaining funds with which to make extensions and additions to its plant and for other purposes properly chargeable to the capital account.

The Antigo Electric Company was authorized to issue $5,000 of stock, the proceeds to be used in making extensions and additions to its plant and distribution system and for other purposes properly chargeable to capital account.

Philadelphia Section Meets.

The Philadelphia Company Section of the National Electric Light Association had a very auspicious fall meeting on Friday evening, October 23. About 375 members were in attendance, a new record. The meeting was held in the New Century Drawing Room, whose equipment and appointments called forth remarks of approval by many of those in attendance. Frank A. Birch, the Section's newly elected chairman, presided. A vaudeville program lasting 45 minutes was presented by the Section Entertainment Committee under the direction of Fred. J. Kuhn. The entertainment consisted of vocal and instrumental selections, including several selections by the Section's new band "The Edison Concert Band of Philadelphia." Although the band has had only five rehearsals, its work was finished in every respect.

Following the entertainment, Joseph B. McCall, president of The Philadelphia Electric Company, made a brief, informal address. W. C. L. Eglin, second vice-president of the company, presented the Doherty Gold Medal to Harold Goodwin, the winner, and Mr. Goodwin made a cordial response. On motion of J. T. Maxwell, a telegram was ordered sent to Thomas A. Edison, congratulating him upon the thirty-fifth anniversary of the invention of the Edison electric lamp.

The speakers of the evening were all company men. Four brief papers were presented by A. F. Mayers, R. A. Huebner, John Meyer and D. F. Schick.

Maine Public Utilities Commissioners Appointed.

The new Public Utilities law of Maine went into effect October 30. Governor Haines has appointed the following members of the Commission, subject to confirmation by the Council: Benjamin F. Cleaves, Biddeford; William B. Skelton, Lewiston; and Samuel W. Gould, Skowhegan. Mr. Cleaves is named as chairman, to serve seven years. He is judge of the Biddeford Municipal Court. Mr. Skelton, a former state bank examiner, is appointed for a term of five years, and Mr. Gould, a Democratic ex-congressman, for a three-year term. The salary of the chairman is $5,000 and of the other two commissioners $4,000. The Board has the regulation of all railways, light, power, water, telegraph and telephone companies, its functions closely resembling those of the Wisconsin Commission.

The same law that creates the new Board forbids the gift of any gratuities by a public service corporation, or any rebate, discount or other discrimination, on penalty of $1,000 fine. Even firemen, police, and members of a company's own employees' families are excluded from receiving such gifts.

Electrical Engineering Problems.

By R. G. Hudson and W. V. Lyon.

DIRECT CURRENTS.

Problem 9.

The copper-clad iron armature of a homopolar dynamo, shown in cross-section in Fig. 10, has a diameter of four inches and revolves at a speed of 3,600 revolutions per minute, the top of the armature turning downward into the paper. When a current of 10 amperes supplied from an external source flows in the stationary field-coil, *FF*, a magnetic flux flows through the rotating armature and stationary field yoke as shown by the dotted lines. The flux density in the air-gap is 50,000 lines per square inch. Each pole-face of the field surrounds the entire armature and has an axial length of four inches. Four sets of brushes *A*, *B*, *C* and *D* surround the armature and are connected as shown in the figure. The internal resistance between the terminals *A* and *D* is 0.004 ohm.

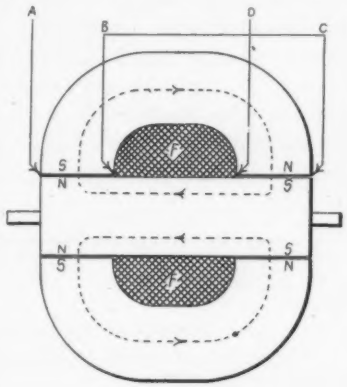


Fig. 10.

Find (*a*) the emf. between the brushes *A* and *B*; (*b*) the direction of the emf. within the armature between *A* and *B*; (*c*) the emf. between the terminals *A* and *D*; (*d*) the current flowing in the armature when an external resistance of 0.026 ohm is connected between *A* and *D*, and (*e*) the potential difference between *A* and *D* after the above external resistance is connected between the terminals.

SOLUTION OF PROBLEM 9.

Each filament on the surface of the armature parallel to the axis moves with a velocity of $\pi\times4\times60$ or 754 inches per second. Since the lines of magnetic flux enter or leave the armature in a direction perpendicular to its surface, the flux-cutting length of each filament under either pole-face is four inches. The emf. generated in such a filament is given by [27] $E=Blv\times10^{-8}$ volts, where (*B*) equals the flux density in lines per square inch perpendicular to the filament and the direction of its motion, (*l*) equals the flux-cutting length in inches of the moving filament, (*v*) equals the linear velocity of the filament in inches per second and (*E*) equals the emf. generated in volts.

Answer to Question a.

By [27],

$E_{AB}=50{,}000\times4\times754\times10^{-8}$

$=1.51$ volts.

Answer to Question b.

The direction of the emf. generated in a flux-cutting filament is easily obtained by holding the thumb, index and middle finger of the right hand in positions 90 degrees from each other. If the thumb points in the direction in which the filament moves and the index finger points in the direction in which the magnetic flux is flowing, the direction of the emf. or electric pressure generated in the filament is indicated by the middle finger. Applying this *right-hand rule* to any filament connected between the brushes *A* and *B* we find that the emf. in such a filament acts from *A* to *B*. Hence the brush-set *B* is at a potential of 1.51 volts above the brush set *A*.

Answer to Question c.

Again applying the right-hand rule to any filament between the brushes *C* and *D* we find that the brush-set *D* is at potential of 1.51 volts above *C*. By [1]

$E_{AD}=1.51+1.51=3.02$ volts.

Answer to Question d.

If a resistance of 0.026 ohm is connected externally to the terminals *AD* the total resistance of the circuit is given by [2],

$R_e=0.026+0.004$

$=0.03$ volt.

The current flowing in the armature or any other part of the circuit is then given, by [6],

$I=3.02/0.03=100.7$ amperes.

Answer to Question e.

The potential difference between *A* and *D* is then given by [3],

$V_{AD}=+3.02-100.7\times0.004$

$=+3.02-0.40$

$=2.62$ volts.

NOTE.—The homopolar type of dynamo was chosen to illustrate the principle of generation of emf. in a dynamo-electric machine because of its simple construction. This type of dynamo possesses little practical value for the generation of high emfs., since a great many armatures must be connected in series and the resistance of the multitude of brush contacts becomes excessive. The homopolar type of dynamo is the only one which requires no commutator.

It should be noted at this point that in analyzing the operation of a dynamo we speak of three voltages: *armature voltage, resistance voltage* and *terminal voltage*. The *armature voltage* is an electromotive force generated by flux-cutting filaments in the armature and is often indicated by other names, such as: *armature emf., generated emf., induced emf., counter-emf.* (applied specially to a motor), etc. In all cases the meaning is the same. The *resistance voltage* of an armature means the potential difference between its terminals due *solely* to the flow of the armature current through the armature resistance and equals the product (I_aR_a). The *terminal voltage*, the potential difference between the terminals of an armature, differs from the *armature voltage* in magnitude by the magnitude of the *resistance voltage*. Whether the *terminal voltage* is greater or less than the *armature voltage* is determined by equation [3]. When the *armature voltage* is greater than the *terminal voltage* the *dynamo* is called a *generator*, and when the *armature voltage* is less than the *terminal voltage* the *dynamo* is called a *motor*.

SOLUTION OF PROBLEM 59.

A transformer is one of the simplest pieces of alternating-current apparatus. It has no moving parts, and consists of a magnetic core or circuit on which are wound two independent coils. If one of these windings is connected to a source of alternating-current supply, power can be taken from the other winding. The frequency of this power is the same as that taken from the source, but the voltage may be, and usually is, different.

Answer to Question a.

The ratio of the voltage impressed on one winding to that measured across the

ALTERNATING CURRENTS.

Problem 59.

A 60-cycle transformer that is rated to deliver 100 kilovolt-amperes has a ratio of transformation of 11,000 volts to 2,200 volts. There are 900 turns in the high-tension winding. The magnetic circuit has an average length of 47 inches and a cross-section of 66 square inches. With the secondary or low-tension circuit open, and with the rated voltage impressed on the high-tension winding, 940 watts is supplied and the current is 0.34 ampere. (*a*) How many turns are there in the low-tension winding? (*b*) What is the maximum flux density in the core? (*c*) What is the iron loss in watts per cubic inch? (*d*) If, in this case, the eddy-current losses are 24 per cent of the total core loss, what would have been the no-load power had the magnetic core been built up of half as many laminations of twice the thickness? (*e*) When this transformer delivers 90 kilowatts at 0.8 power-factor and the rated voltage on the low-tension side, what are the high and low-tension currents?

terminals of the other when no power is delivered is called the ratio of transformation. In this problem, for example, if 11,000 volts is impressed on what is called the high-tension winding, a voltmeter connected across the other, or low-tension winding, would indicate 2,200 volts. The ratio of these two voltages is the same as the ratio of turns in the two windings. Let (N_1) and (E_1) be the turns in the high-tension winding and the voltage impressed on it, and let (N_2) and (E_2) be the turns in the low-tension winding and the voltage across it. Then:

[36a] $E_1/E_2=N_1/N_2$

$11,000/22,000=900/N_2$

$N_2=900\times2,200/11,000$

$=180$

There are 180 turns in the low-tension winding.

Answer to Question b.

The flux in the magnetic core of a transformer depends upon the voltage (E) impressed on the winding, the number of turns (N) in the winding and the frequency (f) of the applied voltage. The flux density (β) is the total flux (ϕ) divided by the cross-sectional area (A) of the magnetic core. These two relations are expressed in [37a] and [38a].

[37a] $E=4.44\ Nf\ \phi_m\ 10^{-8}$

[38a] $\beta_m=\phi_m/A$

The subscript $(_m)$ denotes maximum values of flux and flux density. An alternating current or voltage is measured by its effective value which is, in the case of a sine wave, equal to the maximum value divided by 1.414. An alternating flux or flux density, on the other hand, is always measured by its maximum value. In formula [37a], (E) is the effective value of the applied pressure and (ϕ_m) is the maximum value of the flux in the magnetic core. The unit of flux is called a *line* and the common unit of flux density is one flux line per square inch. By [37a]

$11,000=4.44\times900\times60\times\phi_m\times10^{-8}$

$\phi_m=11,000\times10^8/4.44\times900\times60$

$=4,590,000$ flux lines.

By [38a]

$\beta_m=4,590,000/66$

$=68,000$ lines per square inch.

Answer to Question c.

The power supplied to one winding of a transformer when the other winding is open-circuited consists of two distinct losses. There is current flowing in the winding and this causes a power loss, known as the I^2R or copper loss. See [4a]. When a transformer operates at no load; i. e., when it is *supplying* no power, this copper loss is extremely small and is disregarded. The other of these losses is called the core or iron loss, since it occurs in the magnetic core of the transformer. This loss is due to the rapid reversals of this magnetism of the core. The iron loss is further divided into two parts one of which is called the hysteresis and the other the eddy-current loss.

At no load the entire power input is assumed to be core loss, since there is of course no output, and the copper loss in the winding which is connected to the power mains is extremely small.

Core loss per cubic inch $=940/47\times66$

$=0.303$ watt per cubic inch.

Answer to Question d.

The eddy-current losses depend upon the volume of the magnetic core and the thickness of the laminations of which the magnetic core is built up. The hysteresis loss depends only upon the volume of the core. The eddy-current losses vary as the square of the thickness of the laminations. In this case the eddy-current losses are

$0.24\times940=226$ watts.

With one-half as many laminations of twice the thickness the volume would be the same, so that the eddy-current loss would be the same except for the change in thickness of the laminations.

Eddy-current loss$=2^2\times226$

$=904$ watts.

This shows the importance of using thin laminations. In practice iron about 0.015 inch in thickness is usually used.

The hysteresis loss is independent of the thickness of the laminations and varies only with the total volume of the magnetic core. Since the volume is unchanged,

Hysteresis loss$=940-226$

$=714.$

The total loss$=904+714$

$=1,618$ watts.

The total core loss is nearly doubled by using laminations of twice the thickness.

Answer to Question e.

The ratio of the currents in the two windings of a transformer is the same as the inverse ratio of the voltages. Let (I_1) and (I_2) be the currents in the two windings which have (N_1) and (N_2) turns in them.

$E_1/E_2=N_1/N_2$

But

[39a] $I_1/I_2=N_2/N_1=E_2/E_1$

By [1a]

$90,000=2,200\times I_2\times0.8$

$I_2=90,000/2,200\times0.8$

$=51.1$ amperes.

By [39a]

$I_1=2,200\times51.1/11,000$

$=10.2$ amperes.

The Effect of Telephone Operating Upon the Eyes.

Some time ago and repeatedly since then articles have appeared regarding the effect of telephone operating upon the eyes. A report of the American Medical Association indicated that an investigation had shown that eye-strain resulted, together with many other ailments tributary to the effect of eye-strain and related to other malformations which were brought about through the work involved in handling the telephone switchboard. Refuting these statements, Dr. Le Roy Thompson, Chicago, Ill., has prepared a lengthy review of the subject. Dr. Thompson has been associated for nine years with the Chicago Telephone Company and in his report he states that this company typifies the great advance of the whole Bell system, medically as well as in other lines. Dr. Thompson is oculist and aurist for the Chicago Telephone Company, and chief physician for the Employees' Benefit Association. He has had an unusual opportunity to investigate occupational disease so far as it relates to telephone employees, with special reference to the eye. He severely criticises the report of the American Medical Association and quotes some interesting statistics. From April 1, 1909, to February 1, 1914, there were only 90 cases of eye trouble. This was for an average of over 3,000 employees during that period. In a special study recently made in three of the largest exchanges, employing 707 girls, only 71 were found to be in a physical condition which necessitated a complete

DIRECT CURRENTS.

Problem 10.

In Fig. 11 are shown the elements of an early type of bipolar dynamo. The armature, called a "Gramme ring" armature, consists of an iron ring covered with a continuous winding of insulated copper wire. While the adjacent wires on the armature are insulated from each other, the insulation on the outside of each conductor is removed so that the brushes *A* and *B* may always be in electrical connection with the conductors lying beneath them. The right-handed helical winding advances around the armature in a clockwise direction. The armature flux is produced by a current obtained from an external source, which flows in the conductors wound helically on the field spools. Given the following data regarding this dynamo: flux density in the air-gap, 40,000 lines per square inch; flux-cutting length of each armature conductor, 10 inches; speed of armature (clockwise), 120 revolutions per minute; outside diameter of armature, two feet; number of conductors on armature, 1,000; number of conductors cutting flux at any instant, 800; resistance between brushes *A* and *B*, 0.2 ohm.

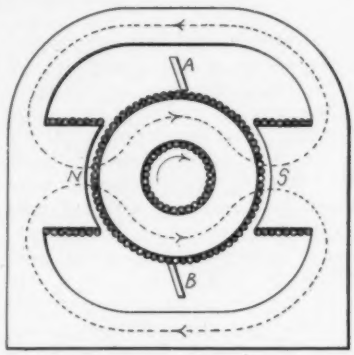


Fig. 11.

Find (*a*) the emf. between the brushes *A* and *B* at no load; (*b*) the respective polarities of the brushes *A* and *B*; (*c*) the current flowing in the armature when an external resistance of two ohms is connected between the brushes; (*d*) the potential difference between the brushes; i. e., terminal voltage, after the external resistance is connected; (*e*) the power output at the terminals of the dynamo, and (*f*) the power lost in heating the armature conductors.

This problem illustrates the essential features of a simple dynamo equipped with a commutator.

ALTERNATING CURRENTS.

Problem 60.

The magnetic core of a 500-kilovolt-ampere transformer has a cross-section of 88.25 square inches and an average length of 131 inches. There are 746 turns in the high-tension winding, and 156 turns in the low-tension winding. The rated high-tension voltage and frequency are 11,000 volts and 60 cycles. The rated core loss is 2,960 watts, of which 710 watts is due to eddy currents. (*a*) What would be the core loss for an impressed voltage 15 per cent greater than the rated value? (*b*) What would be the core loss at the rated voltage but with a frequency of 50 cycles instead of 60 cycles? (*c*) What would be the core loss if the transformer received its power from a 12,700-volt, 50-cycle circuit?

This problem illustrates the way in which the core loss in a transformer varies with the impressed voltage and frequency.

Solutions of the above problems and two new problems will be printed in the next issue.

physical examination, and of the 71 there were only two taken off duty as being too ill to work. Compared with the work done by typesetters, bookkeepers, stenographers and draftsmen, Dr. Thompson claims that a telephone operator has as much relaxation and sometimes more than any of the others who continuously apply themselves to their given occupation, which is all practically at the same distance from the eye.

In the report of the American Medical Association emphasis is laid upon the damage done to the eye because of the incessant flashing of the indicating lamps. As a matter of fact, the signal lamps, the strongest of which is less than one candlepower, has a protecting cover, or opal as it is called, made of glass, which is semi-transparent, measuring nine millimeters across its greatest diameter, and six millimeters thick. These lamps are in three colors—white, red and green, and the opals amply protect the eye from ultra-violet, chemical, or dazzling rays. The average time any of these lamps are lighted is 3.2 seconds, and it is not necessary that the operator look intently even that long at any one light. The arrangement of numbers in groups of five with plain letters and individual marks makes the finding of the numbers by the operator almost intuitive after she has worked a few days. The illumination of her work is as nearly perfect as engineering and science can make it, careful provision being made to protect the eye from any direct rays and yet afford ample light to see the numbers. Every operator has a relief of 15 minutes for complete relaxation every two hours, and a half hour to an hour for her lunch, which is provided in the exchange free of charge.

Analyzing the report of the American Medical Society in detail, Dr. Thompson states in practically every instance that the claims made therein either can not be proven or the distress involved is not unusual and not unlike that which is prevalent in any other occupation.

Attendance records show that in several of the largest exchanges one girl had not been absent for sickness in eight years; four in four years; seven in three years; 11 in two years. Altogether there were 425 girls absent for longer or shorter periods during an entire year. This out of a force of over 4,000 girls. The apparent short length of service of telephone operators is due to their propensity for getting married after short periods of service, and they have healthy families as well as happy domestic lives in spite of the statements quoted from the above mentioned report.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.

Seventh Annual Convention, Chicago, October 26-30.

The seventh annual convention of the Association of Railway Electrical Engineers was held at the Hotel La Salle, Chicago, October 25 to 30. The first session was called to order by President C. R. Gilman, on Tuesday morning, and reports of the secretary-treasurer and various committees presented. These included the report of the Committee on Loose-Leaf Binders for Filing Specifications, and the report of the Committee on Reciprocal Relations, all indicating substantial progress.

At the afternoon session, the report of the Committee on Specifications for Wire Crossings for Potentials Above 100 Volts, was presented by J. R. Sloan. This Committee reports that its efforts to co-operate with the Association of Telegraph Superintendents has so far been unsuccessful, and that no specifications can be approved until a conference is had with this Association.

The report of the Committee on Data and Information was then presented by Edward Wray, chairman. This Committee has continued the work of previous committees in tabulating car-lighting statistics, to which are added data on other electrical equipment in railroad service. A new line of investigation undertaken by the Committee is an investigation of the entire electrical equipment used by each of 43 railroads. This information is tabulated, showing the number and types of lamps used for general illumination, the number, capacity and type of generators used in power plants, the number, size and type of motors used in railway shops, and the electrical equipment on transfer, turn tables, hoists, etc. Operating data on crane and hoist motors are also presented in the report.

The report was discussed briefly by J. R. Sloan, D. J. Cartwright, J. A. Andreucetti, T. V. Buckwalter, and H. C. Meloy. President Gilman commented on the table showing the percentage of alternating-current and direct-current motors in shop service, and asked as to the results which are being obtained by various railroads.

Mr. Andreucetti stated that since the installation of alternating-current motors in shops of the Chicago & North Western Railroad, the motor maintenance expense has been materially decreased, and in addition many of the troubles encountered with direct-current motors have been eliminated. Considerable of the discussion related to the data presented on cranes, which did not seem to agree with the present practice in railroad service.

The report of the Committee on Standards was then presented by D. J. Cartwright. The recommendations submitted by this Committee related particularly to axle pulleys, generator pulleys, and generator-pulley fits on armature shafts. The recommendations presented were agreed upon during conferences with manufacturers of this material.

At the session on Wednesday morning, the report of the Committee on Electric Headlights was presented, in the absence of the chairman, by George E. Murray. This report points out the rapid advance made by electric headlights. Most of these equipments were installed in compliance with the laws of various states, and as the interpretation of these laws has caused quite a difference of opinion, it was only natural that the installations were not made until near the expiration of the time set by the law. This resulted in the equipment being installed in a somewhat haphazard manner, by inexperienced men, and lack of uniform methods. Realizing this situation, the Committee proposes standards to be used in headlight installation, as well as standards for the equipment itself. The report considers the type of machine, location of generator, voltage adjustment, reflectors, wiring, etc. Regarding the generators, manufacturers have standardized the compound-wound machine, which seems to be preferred. Three voltages are in use, namely, six volts for incandescent-lamp machines, and 30 volts to 110 volts for arc or incandescent. The 30-volt machine seems to have been most widely used. Regarding reflectors, the Committee suggests that the old oil-lamp reflectors be discarded when electric headlights are installed, and a reflector suited for the purpose be used.

Regarding wiring, it is pointed out that the majority of the railroads today are wiring their engines through the hand rail. Using one-inch conduit, with condulets and outlets with special connection box on the cab, so that the cab or conduit can be removed without interfering with the wires, offers the best solution of the wiring problem. Open wiring, using wooden cleats, is preferred, as little experience is necessary in making repairs, and the expense is about one-third of a conduit installation.

The report was discussed briefly by George E. Murray, J. A. Andreucetti, Mr. Gardener, and President Gilman. The consensus of opinion seemed to be that rubber-covered wire in conduit was more suitable for cab wiring than the open wiring suggested in the report.

There was also some discussion regarding the voltage of cab lamps, the Committee reporting that the voltages of such lamps at present runs from 28 to 40 volts, using 30-volt generators. The subject was deemed of sufficient importance to justify a full investigation on the part of the Committee for its next report. J. L. Minick thought that attention shuld be given the six-volt headlight equipment, as the success of the six-volt incandescent lamp has made possible the use of this size equipment for locomotive headlights.

C. W. Bender thought that the success of this lamp in automobile service would justify its employment for headlight use.

Following the discussion on this report, a paper, entitled "Communication to and Between Trains by Wireless Telegraph, Wireless Telephone, and Telephone," was then presented by F. H. Milner.

This paper reviews the history of wireless telegraphy and telephony and comments upon some of the difficulties at first encountered. As early as 1906 the Union Pacific Railroad experimented with wireless communication in an effort to signal the engineer of a moving train without employing any equipment that would interfere with or obstruct the company's right-of-way. For this purpose the services of a storage battery electric truck were utilized. The machine weighed 5,500 pounds, with the batteries in place, and was made of iron and steel and ran around the shop yards on a narrow-gauge track. The car was built by the Westinghouse Electric & Manufacturing Company and power was developed by a series wound motor. The car was equipped with an aerial or antenna, and many and thorough experiments were tried with it. The car was caused to back and move forward at four different speeds, ring a bell, etc., at the will of the person at the wireless key. Antennae were placed on buildings, alongside the track various methods were used to receive the impulse on the car and transform it into mechanical motion; the practical application of this experiment lay in the fact that the iron and steel car was a capacity in itself and therefore it did not make any difference whether there was a good ground connection or not, as the car would work just as well when it was insulated from the ground as when connected directly by wire. Dr. Milner states that this electric truck has been very valuable for experimental purposes, because it had 186 volts direct current and plenty of power. However, on a railroad, a danger signal must operate at least 100,000 times in succession without a failure, and must not be operated by any other means than the means intended and as the lighting of an arc light or atmospheric disturbances will sometimes throw the signal, and as the best coherer or valve detector will not last for anything like 100,000 operations without a failure, work on

the mechanical wireless cab signal was discontinued, although no difficulty presented itself which could not be overcome, except that it was not reliable.

Experiments were next undertaken to communicate between stations by means of wireless telegraphy and four stations erected, one at North Platte, Neb., one at Green River, Wyo., one at Cheyenne, Wyo., and one at Omaha. Alternating current at 550 cycles, 12,000 volts is used. Successful experiments have also been conducted in wireless telephony between cars of a moving train and between train and stations. Dr. Milner showed views of this equipment and of other experimental work he is doing.

The report of the Committee on Industrial Trucks was presented by T. B. Buckwalter at the session on Wednesday afternoon.

This committee has considered the following phases of industrial trucks: capacity, speed, voltage, motors and batteries, tires and wheel sizes. A standard capacity of 4,000 pounds is recommended as most suitable for railway work. The speed is recommended at 5 miles per hour with loaded truck for general railroad service and 7 miles per hour for operation under special conditions where runs are comparatively long. It is suggested by the committee that wheel sizes be standardized to include five diameters, namely, 10 inch, 16 inch, 20 inch, 22 inch and 27 inch. At present there are over 31 sizes of wheels, which means that tire cost must remain high. The report discusses the convenience of 12 cells of battery and recommends this number for industrial trucks, the voltage to be 24. When Edison batteries are used 21 cells assembled in three trays of seven cells each are recommended.

This report was discussed briefly, the question of voltage being given the greatest consideration. It was finally agreed that use of 24 volts for industrial truck batteries be standardized. This was unanimously passed. It was also agreed by the Association that wheel dimensions for industrial trucks be standardized, and that the dimensions recommended in the report be adopted. The capacity of industrial trucks for railroad service was also standardized at 4,000 pounds, and a standard speed of five miles per hour, with loaded trucks, adopted.

The report of the Committee on Electric Traction was then presented by J. R. Sloan. This report reviews the present status of electric traction as applied to steam railroads, and presents the principal features of, and reasons for, electrification. All important electrification projects in Europe, as well as in this country, are described briefly, and the various systems, namely, the direct-current low voltage, direct-current high voltage, alternating-current, single phase with commutating motors, alternating-current three phase with induction motors, alternating-current single phase with induction motors, were described. The advantages of electrification of tunnels, mountain divisions, and passenger and freight yards, were pointed out. The section of the report dealing with terminal improvement, electrification of suburban divisions, and single track roads, was rejected.

Following the presentation of this, the report of the Committee on Wire Specifications was presented. This is a voluminous report, divided into four parts, Part 1 treating on the general scope of the specifications and co-operation received from other organizations; Part 2 with order forms for ordering wire; Part 3 with general specifications covering all details of wire manufacture and service; and Part 4 dealing with terminology. In addition, there are fourteen tables, presenting test data on wire.

On Thursday morning the report of the Committee on Axle Equipment was presented by H. R. Bucks. This report deals with the development of this type of equipment and presents data on the cost of maintaining such equipment. The report shows that almost without exception the railroads operating in the northwest quarter of the United States favor the head-end system for long runs on through trains, while the axle system is preferred elsewhere.

Following this the report of the Committee on Head End Equipment was presented by A. R. Hare, chairman. This report likewise covers the development and progress of axle-light equipment in head-end service the last year. The report is necessarily confined to the description of unit axle-light equipments developed and used by the Northern Pacific Railway.

The report was discussed briefly by Messrs. Pomeroy, Cartwright, Bucks, Gardener, Billau, and Sloan.

At the same session on Thursday afternoon, the report of the Committee on Standard Rules for Car Wiring was presented by D. J. Cartwright. This report presents specifications which it is suggested that the railroads adopt for car wiring, regarding the use of conduit, wires, switchboards, fixtures, battery boxes and charging receptacles. Some of the details involving general practice will be commented upon in a future issue. In this report the expression "hot galvanized steel conduit" was published by error. It should read "galvanized or sherardized steel conduit."

This report was followed by the report on Outside Construction and Yard Lighting. The report is confined particularly to outside construction dealing with pole spacing and setting, the use and installation of anchor logs, guy wires, etc., and pole fittings, such as cross arms, pins, insulators, etc.

Considering overhead distribution, it is suggested that high-tension circuits be eliminated as much as possible and electricity be supplied from one secondary distributing system. This general recommendation should apply to both lighting and power, except when the power units or local lighting load are of such capacity as to make it impracticable. It is recommended that with overhead construction transformers be placed on poles, and that they be attached to an independent cross arm or fixture located below the lowest cross arm carrying wires. Distributing circuits should be properly protected by lightning arresters or ground wire run on top of pole line, or possibly a combination of both, with due consideration being given the use of choke coils. Underground construction is recommended in preference to overhead construction, because of the greater assurance of continuity of service, elimination of accidents, damage by storm, or general interruption of service on account of an individual pole having been broken by derailment. For trunk lines, the use of fiber conduit is recommended. Detailed recommendations are made concerning the location and construction of man-holes and branch lines.

Regarding yard lighting, the Committee recommends that ample illumination be provided over the entire yard, particularly at switches. Series lighting system is suggested as best adapted to the requirements.

The report of the Committee on Illumination was then presented.

The committee reports work along specialized lines during the past year dealing with day-coach lighting, illumination of classification yards, and a resume of recent developments in arc and incandescent lamps. The data on day-coach tests were published in book form separately. Regarding the lighting of classification yards the following are suggested as the conditions to be met for ideal illumination. (a) Illumination of the grade leading from the scale to the yard. (b) Illumination of the switches at the head of the yard to facilitate control of car movement from the switch tower. (c) Illumination of every track irrespective of the adjacent car. (d) Illumination of every car in the yard. (e) Absence of glare from every position in the yard. Curves showing distribution of arc and incandescent lamps are included in the report.

On Friday morning the report of the Committee on Shop Practice was presented by J. R. Sloan. This report deals with electrically operated transfer and turn tables, hoists and cranes. Further comment on this report will be made in a subsequent issue.

The election of officers, which then took place, resulted as follows:

President, H. C. Meloy, Lake Shore & Michigan Southern Railway.

Senior vice-president, E. W. Jansen, Illinois Central Railway.

Junior vice-president, C. J. Causland, Pennsylvania Lines.

Secretary-treasurer, J. A. Andreucetti, Chicago & North Western Railroad.

As has been the custom during the past years, the Railway Electric Supply Manufacturers' Association maintained elaborate exhibits on the 19th floor of the Hotel La Salle. These were even more comprehensive than last year, and indicated the progress which is being made in electrical equipment for railway service. Particular advancement is noticeable in lamps and fixtures for car lighting.

Among the companies exhibiting, were the following: Adams & Westlake Company, Albert & J. M. Anderson Manufacturing Company, American Pulley Company, Appleton Electric Company, Benjamin Electric Manufacturing Company, Central Electric Company, Chicago Fuse Manufacturing Company, Consolidated Railway Electric Lighting & Equipment Company, Crouse-Hinds Company, George Cutter Company, Delta-Star Electric Company, Economy Fuse & Manufacturing Company, Edison Storage Battery Company, Electric Storage Battery Company, Electrical Testing Laboratories, Flexible Steel Lacing Company, General Electric Company, Gould Coupler Company, Harter Manufacturing Company, Holophone Works of General Electric Company, Kerite Insulated Wire & Cable Company, Main Belting Company, National Lamp Works of General Electric Company, National Metal Molding Company, Oneida Steel Pulley Company, Peerless V-Belt Company, Pyle National Electric Headlight Company, Safety Car Heating & Lighting Company, Sangamo Electric Company, United States Light & Heating Company, Western Electric Company, Westinghouse Lamp Company, and Willard Storage Battery Company.

American Exhibits for Spain.

Señor Alejandro Berea y Rodrigo, consul of Spain at New Orleans, La., has informed the Bureau of Foreign and Domestic Commerce of a proposal to establish a commercial museum in Spain, in which are to be exhibited samples of products from practically every country in the world. The consul will be glad to receive offers of such exhibits from American manufacturers, and announces that he desires to assist in the work of promoting commerce between Spain and the United States.

TELEPHONE PIONEERS OF AMERICA.

Old-Time Telephone Men Have Happy Meeting at Richmond, Jamestown and Washington.

The fourth annual convention of the Telephone Pioneers of America was held at the Hotel Jefferson, Richmond, Va., Thursday and Friday of last week. There was an attendance of over 400, all of whom were identified with the telephone industry twenty-one years or more ago, and the great majority of whom had been in continuous service in this field since first entering it.

Thomas D. Lockwood, first vice-president of the Pioneers, called the meeting to order in the absence of President Theodore N. Vail, in the hotel auditorium, and J. W. Crews, vice-president of the Chesapeake & Potomac Telephone Company, then introduced Mayor George D. Ainslie, of Richmond, who welcomed the visitors in a witty and complimentary address.

After reading and approving reports of the secretary and treasurer, the following officers were elected for the ensuing year:

President, Theodore N. Vail.

Vice-presidents, Thomas D. Lockwood, Thomas B. Doolittle, Angus S. Hibbard, George E. McFarland.

Treasurer, George D. Milne.

Executive Committee, Edgar F. Sherwood, James T. Moran, Charles E. Scribner, Charles G. Dubois, James Robb.

A telegram of sympathy was sent Secretary Henry W. Pope, who was prevented from attending through illness, R. H. Starrett ably filling his place.

At the afternoon session several interesting addresses were delivered. J. S. McCullough told of the first use of the telephone in 1882 for train dispatching on the West Shore Railroad in New York State, and Angus S. Hibbard described the origin of the Blue Bell as the sign of the Bell telephone companies. Mr. Hibbard had suggested the design in the late eighties and, with some changes suggested by E. J. Hall, it was adopted, and its use has now become universal wherever the Bell telephone is in service.

N. T. Guernsey, general counsel of the American Telephone & Telegraph Company, spoke at some length on "The Relations of the American Telephone & Telegraph Company to the Telephone Business." After reviewing the early history of the telephone and the work of its inventor, Alexander Graham Bell, Mr. Guernsey spoke of the work of the Engineering Department of the American Telephone & Telegraph Company, under the chieftainship of John J. Carty, as follows:

The emphasis placed upon what has just been discussed should not lead to a lack of appreciation of the technical work in connection with patent applications or during the years of strenuous assaults upon the fundamental Bell patents, or in the protection guaranteed to the associated companies and their subscribers in the use of patented devices. This work has been done with such great efficiency and thoroughness that its success, evidenced by the almost entire absence of infringement suits against either the associated companies or subscribers, might almost excuse a failure to apprehend its importance.

What the engineering department has done has been to create and develop the science and art of telephone construction and operation. The experimental and research department which was created at the outset is now directed by a staff of more than five hundred and fifty engineers and scientists, who, as to this particular work, in knowledge, experience, ability and special fitness, have brought together for the Bell System more than the aggregate of what is available outside of it.

Adopting from Mr. Carty a peculiarly comprehensive and lucid statement,

"The work of the department consists of work upon the design and standardization of apparatus and methods of plant engineering and construction. It consists in standardizing, studying, and developing traffic methods which relate to the way in which traffic should be handled, and to the general arrangement of the switchboard, trunk lines and so forth." This includes all that relates to what we may call the physical part of the construction and operation of telephone plants.

This department also deals with important and far-reaching questions growing out of interferences produced by lightning, and electric light and power currents, and with the development of the art of transmission over wires, as to whicn it has established a scientific basis and has made new discoveries whose importance cannot be over-estimated. There is no detail of plant construction, local, suburban or long distance, and there is no item of apparatus or equipment which does not owe to the engineering department something which makes for economy and efficiency.

There is a division of traffic efficiency, which studies with minute care every operation and every rule and regulation, and every piece of apparatus, to the end that the service be quick, reliable and accurate. There are experts at work developing the lines of transmission, increasing the range over which speech may be transmitted; there is a division whose duty it is to ascertain and to reduce the amount of copper employed in the line. There are those whose duty it is to study the plant management and traffic management; there are those who maintain an intelligence department, so that anything of interest, even if it be merely a mention of something in a newspaper, may be immediately made the subject of inquiry. Essential work is done by the patent division, in connection with the determination of what is useful as well as new. Another division makes what are called development studies; that is, studies of the growth of the United States and of each of the cities of the United States, so that the trend of development may be ascertained and so that there may be a broad point of view to aid in determining what investments may properly be made and when and where they should be made.

A striking characteristic of the engineering department is that it not only attempts to do these things, but that it

does them, and that its results are characterized by certainty. This is the verdict of the telephone world. The fact that within ten years the Bell companies have expended for construction and reconstruction an amount more than equal to the present value of their entire plant means not waste but progress. It is a complete answer to the suggestion, sometimes made, that inventions are suppressed through motives of economy or otherwise.

Take as an illustration the transmitters and receivers. Since 1877, there have been introduced fifty-three types and styles of receivers and seventy-three types and styles of transmitters, each of which was an improvement upon its predecessor, and a distinct step forward. Of the twelve million telephone receivers and transmitters owned by the Bell company on January 1, 1914, none were in use prior to 1902, and their average age was less than five years.

Improved transmitters and receivers, with the metallic circuit and transpositions, extended the range of telephonic transmission beyond the practical limits of iron wire as a medium. The engineering department met the situation by invading the province of the wire manufacturers and obtaining hard drawn copper wire; and with a complete new technique for the handling of this wire from the process of manufacture until it was strung upon the poles, made available the substance best fitted to fill the requirements of a conductor for telephonic purposes. This new product has become standard for all telephone lines in all parts of the world.

The problems with reference to underground transmission have been met and solved. In 1905, conversations could not be had over long distance circuits including as much as twenty miles of underground. In 1906 the underground talking distance had been increased to ninety miles. Communication is now possible between Boston and Washington, a distance which is four times the length of the longest European underground line. The capacity of cables, without increase in their size, has been developed from two hundred to eighteen hundred wires, resulting in enormous savings, not only in copper but in conduit space. Phantom circuits, making three circuits out of two pairs of wires, duplex cables to bring them into cities, and the application of loading to open wires and cables, are each matters of enormous value to the associated companies and to the business.

The standardization of instruments, switchboards, and everything else that pertains to telephone operation, has always been of great importance, and with the rapidly increasing radius within which telephone communication is commercially possible, has become vital. In Paris, where the transmitters and receivers are owned by the subscribers, the government deemed it necessary to permit the use of any instrument deemed fairly efficient. Some one hundred and fifty styles were in use, so diverse in character and appearance that any unusual attachment to a wall was assumed to be a telephone. As a consequence, the service became so intolerable as to create a persistent popular demand by the subscribers for standardization.

The foresight of the general staff prevented such an experience here. This is but one of the innumerable instances in which this foresight has saved the public and the associated companies from actual experiences which would have at least had the merit of bringing home in a very concrete way the value of the service rendered by the general staff. The economies of standardization are enormous, but they become insignificant when compared with the impairments of and limitations upon the service which lack of standardization would involve.

A further broad field is presented in the development of improved traffic methods and their intimate relation to parts of the plant, improvements in the efficiency of toll operating methods, and improvements in local operating practices and equipment, each of which is a factor essential to the efficiency and economy of the system.

I believe it is within the facts to say that each change in telephone plant, equipment and apparatus which has had the sanction of the engineering department has been a step forward, and that never has it been necessary to go back because of a mistake. When it is apprehended that this means that the experience account of the associated companies, in the sense that such an account covers the cost of learning by experience what is best adapted to one's needs, has been substantially eliminated, the enormous saving which has been brought about through this branch of the general staff can hardly be comprehended. Probably it would not be an overstatement to say that it exceeds the present total investment in physical property.

The service rendered to the associated companies by the Western Electric Company is both practical and important. The telephone pioneers were men of imagination and foresaw the conditions which warranted the recent authoritative statement by Mr. Vail that "telephone communication is established between New York and Denver, is potentially possible between all points in the United States, and by 1915, will be an accomplished fact between New York and San Francisco."

As has been stated, the gradual increase of the radius within which telephonic communication is practicable until it has become substantially unlimited, has demonstrated the imperative necessity of standardization. Efficient, satisfactory long distance service can only be effected by the complete, harmonious co-ordination of a large number of animate and inanimate factors. It involves standardization of instruments, of apparatus, of plant and of operation. This standardization has been dynamic, not static—it has made for progress and against stagnation. It was necessary not only to establish standards, but also to make it possible to comply with them. Through the Western Electric Company the associated companies are assured that there will be at all times available for them such apparatus and equipment as they require, and that it will conform to these necessary standards.

In conclusion Mr. Guernsey said: As a matter of fact, the Bell standards in apparatus, equipment, construction and operation are the world's standards in the telephone industry. It has never been proved that something else is as good. It has hardly been claimed that anything else is better. The United States has over 65 per cent of all of the telephones in the world. Its telephone service, both local and long distance, is so much better than the service anywhere else in the world, that there is nothing with which it can be compared. The telephone exchange revenue per station per annum in the United States is but $30.45 against $32.63 for Great Britain. What there is good in the telephone service of other countries is copied or adopted from the United States. Such results as these would not have been possible had not the principles underlying the Bell organization been thoroughly sound.

At the outset, I said that the relation of the American Telephone & Telegraph Company to the telephone business is defined by its relation to its associated companies. Broadly, this is true, because what it has done for them, it has done for the telephone business as a whole. Eighty-five per cent of the telephones in the United States, and this means 55 per cent of the telephones in the world, are a part of, or are connected with, the Bell System. This is true because what the original telephone pioneers believed, the public, as the result of its experience, has accepted as demonstrated, namely, that from the public point of view the most valuable service is a single, universal service.

Not only was the central organization, with its general staff, the normal, natural, logical means for the development of an efficient telephone system in the United States, but it is the only means through which universal, efficient, economical service is a possibility. Not only is the general staff the best means for performing this service which is rendered to the associated companies, but it is the only means, as well as the most economical means, by which that service can be performed.

Very few, if any, companies could afford to maintain separate organizations such as the general staff maintains for the benefit of the Bell System. But grant that they could afford this, and grant that they could obtain the men of capacity equal to this general staff. With the men and capacity, there must be combined the judgment and what may perhaps be called the telephone intuition, which cannot be bought but which are the product of thirty years' intimate association with the combined telephone practice and experience of the world. To create this judgment and intuition, this central organization, and the co-operation with it of the various parts of the system, were absolutely essential. Twenty systems or forty systems operating independently and jealous of each other, could none of them have this fundamental basis of facts and experience to form the broadest basis from which patient and exhaustive study may make deductions. Twenty or forty independent companies, jealous of each other, would mean twenty or forty independent standards and many times twenty or forty effective handicaps upon any effort to give efficient long distance service. It would mean twenty or forty independent organizations, in a race in which each sought to acquire and retain for itself the benefit of every step forward in the art. Without the organization which has made the general staff possible, the service which it has rendered could not be secured, and telephone service such as is found today in the United States would not exist.

This means that the value of this service is measured only by the value of telephone service itself. As to its cost, a word will suffice. The charge, measured by the instruments under the original license contracts, was at first $20.00 per set per annum. These contracts, modified from time to time, constitute the basis upon which this service is furnished. The American Telephone & Telegraph Company still furnishes the instruments, but it has upon its own motion made such reductions in the charges

that for 1913 they averaged only $1.54 per set. And the service rendered has increased relatively more than the charge for it has decreased.

Briefly summarizing:

(1) The Bell organization is not an artificial organization. It is the normal, natural result of the conditions surrounding the invention and development of the telephone—inevitable, if the public is to have the best and most comprehensive service at the minimum expense.

(2) This organization has afforded the associated companies service and assistance which have been of vital influence in developing and building up the telephone service in the United States.

(3) The results attained through this organization have demonstrated that it is essentially and fundamentally right. The inevitable result of the consistent application for over thirty years of theories of organization that were out of accord with sound economics or the public interest, would have been complete failure; the result could not have been a telephone system showing the highest development and giving to the public the cheapest, best, most efficient, and comprehensive telephone service in the world.

(4) No substitute for the single system and central control, which are the dominating characteristics of the Bell organization, could have attained, at the same cost, or at any cost, results of equal benefit to the public, whether measured by the character of the service, its cost, its efficiency, or its universality.

It is natural that the first generation of telephone pioneers, looking back upon the marvelous achievements of less than forty years, should feel that what can be accomplished has been accomplished; should feel that there is little to add, except in the way of refinements, to a telephone service that is approaching in scope the limits of the imagination of its founders, and that in efficiency and accuracy is the model of the world. But this is a delusion to which each generation in its wisdom has been subject. It is a mistake. There always remains more to be done than has been done; the possibilities of the future are greater than the accomplishments of the past.

The Pioneers were the guests of the American Telephone & Telegraph Company at a banquet at the Hotel Richmond Thursday evening, a boat trip along the James River Friday, and a visit to historic Jamestown, dinner at the Hotel Chamberlain at Old Point Comfort, Va., Friday evening, where President Theodore N. Vail greeted them in person and concluded with a night boat trip to Washington, D. C., where the gathering spent Saturday visiting all points of interest. The majority of the Eastern delegates returned on the early train on Sunday. While in Richmond the ladies in attendance were given an automobile ride to points of interest in and around Richmond. The entertainment was greatly appreciated and enjoyed by all.

The ladies were guests at the banquet at Richmond, and most happily added to the success of the songs lead by Mr. Hibbard. "Tipperary" was the favorite melody. Informal addresses were delivered at the banquet under the guidance of Toastmaster Thomas D. Lockwood, by U. N. Bethell, J. W. Crews, Leland Hume, and James T. Moran. Mr. Bethell was particularly happy and witty in his response, and his description of the Telephone Pioneers as one big and really happy, loyal family was greeted with enthusiastic favor.

The only person present from the old telephone company of New York—the first in that city, and the predecessor of the present New York company—was Captain W. L. Candee, now president of the Okonite Company. The Telephone Company of New York was organized in 1877 with the following officers: Charles A. Cheever, president; Hilborn L. Roosevelt, vice-president; W. K. Applebaugh, superintendent; W. L. Candee, assistant superintendent; the last named being the only living member of that pioneer telephone company.

This fourth convention of the Telephone Pioneers was unique in its instructive and historical features, and the gentlemen who planned it gave a rare treat in this respect to all present, and every one greatly appreciated the excellent arrangements.

Among the well known Pioneers present were the following: U. N. Bethell, B. E. Sunny, Alonzo Burt, John J. Carty, Thomas D. Lockwood, Angus S. Hibbard, C. Jay French, Thomas B. Doolittle, James T. Moran, Richard T. McComas, Willard L. Candee, George T. Manson, Wm. H. Baker, Dr. Moses G. Parker, R. W. Devonshire, F. H. Bethell, R. H. Starrett, W. E. Huntington, J. J. Ghegan, Charles H. Wilson, James Robb, W. T. Gentry, Leland Hume, Charles W. Price, W. J. Keenan, Fred H. Boynton, Frank Harrington, H. F. Thurber, J. W. Crews, S. M. Greer, T. T. Cook, C. B. Doolittle, P. G. Burton, Dr. Victor M. Berthold, J. Epps Brown, James F. Canfield, Alexander Cameron, Thomas Dusenbury, Edward B. Field, Arthur Lockwood, Harry G. McCully, J. S. McCullough, George D. Milne, E. D. Nims, Peter T. Reilly, Frank C. Ross, Charles E. Scribner, J. B. Taltaval, William T. Westbrook, Jr., D. Leet Wilson, G. E. McFarland, Casper E. Yost.

Electrolysis in Providence.

A survey of electrolysis conditions in Providence, R. I., has been made by Robert L. Brunet, assisted by James A. McKenna.

The Rhode Island Company, operating the street car system of Providence, co-operated in the survey, which included an examination of current leaks in the electric railway system.

Electrical energy for this system is generated at the Manchester street station and there, in part, transformed to direct current for street railway operation, and in part transmitted at 11,500 volts to sub-stations in various parts of the company's territory. The transmission line to Olneyville is carried in underground ducts owned by the Narragansett Electric Lighting Company.

At various points in the city test stations were established to determine the volume of current in gas and water mains and their direction.

The largest amount of current measured at any one of the 11 testing stations was 13 amperes. At seven of the stations no current was registered. These were mostly at points where there had previously been trouble and insulating joints had been installed.

Considerable damage was found near the North Main Street car house, due to soil conditions and potential differences between gas and water mains. There are 35 insulating joints in the city, this number being considered too few for a city of the size of Providence.

Mr. Brunet has requested that the Rhode Island Company be asked to make yearly tests of the condition of its tracks, bonds, cross-bonds, etc., by means of a test car.

Other recommendations include the installation of pilot wires to determine the overall potential drop in the track, the determination of the potential gradients, the use of negative returns, the yearly examination of the bonding system, and the elimination of all metallic connections.

Motor-Drive Reduces Liability Insurance Rates.

The suggestion was made in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN some time ago that an argument in favor of the use of the electric drive instead of steam would be the reduced accident hazard, resulting in lower rates for liability insurance, as soon as the insurance companies put into effect an analytical rating system, such as had been considered for some time.

This is now being done, the Workmen's Compensation Bureau of New York representing the companies in the preparation and application of the schedule. It is being applied in states where workmen's compensation laws have been enacted, as the necessity of increasing rates due to the larger losses which must be paid has emphasized the inequitable character of the old system of charging the same rate against all plants in a given class, and has suggested a discrimination in favor of those which have eliminated the accident hazard as far as possible.

A statement of the credits given under the analytical schedule includes the following:

"Where each power-working machine is driven by a direct-connected or individual motor.

"Where machines are driven in groups of not more than ten machines to the group."

Credits are also given for the absence of boilers and engines, which follow the use of motors and central-station service.

Federal Power Development Incidental to Reclamation Work.

At a meeting of water users of the Boise Government reclamation project recently held near Caldwell, Idaho, a paper prepared by Supervising Engineer Weymouth discussing the question of the development and disposal of electric power incident to the reclamation work at Arrow Rock and at the government diversion dam on the Boise River above Boise, Idaho, was read. In this paper Mr. Weymouth points out some of the good and bad features of federal development and submits important facts and figures to the settlers on the Boise project.

To show that the government engineers have impartially considered all sides of the question of government power development, Mr. Weymouth's discussion of the situation is published in part as follows:

"All power development on reclamation projects is done under Section 5 of the Act of Congress approved April 16, 1906, which is as follows:

" 'That whenever a development of power is necessary for the irrigation of lands under any project undertaken under the said reclamation act, or an opportunity is afforded for the development of power under any such project, the Secretary of the Interior is authorized to lease for a period not exceeding 10 years, giving preference to municipal purposes, any surplus power or power privilege, and the money derived from such leases shall be covered into the reclamation fund and be placed to the credit of the project from which such power is derived, provided that no lease shall be made of such surplus power or power privilege as will impair the efficiency of the irrigation project.'

"When the construction of the Arrow Rock dam was decided upon it was found that the local power companies did not have sufficient surplus capacity to provide for the needs for power for construction purposes at Arrow Rock, consequently there was constructed the power plant located at the diversion dam for this purpose. This plant is built in a permanent manner so that after the construction of the Arrow Rock dam is completed it can be utilized in any manner under the law that will best serve the interest of the Boise project.

"This plant, exclusive of the transmission lines leading from it to Arrow Rock, cost a total of $168,000 and has a capacity of 3,000 horsepower when the river is carrying over 1,300 second-feet of water. The possible power output of this plant decreases with the flow in the river until a minimum of about 1,100 horsepower is reached during the extreme low water period of the river.

"To the end of July nearly 8,000,000 kilowatt-hours of energy have been used in connection with construction work at Arrow Rock and nearly 5,400,000 kilowatt-hours have been sold to local companies, since their present installation is not sufficient to supply their present requirements. This power sold has brought a total revenue to the credit of the project of nearly $22,000. These sales have recently amounted to between $2,000 and $3,000 per month.

"After the Arrow Rock dam is completed the best use for the project of this plant will be to sell for all-year-around purposes such power as can be developed throughout the year and this all-year-around power, amounting to about 1,100 horsepower should command a good price. The additional power capacity of the plant over and above this 1,100 horsepower reaches a maximum of about 1,800 at the height of the irrigation season and it is thought that it will be necessary to sell this additional power at a lower rate, as it will only be available during the summer months and it is probable that the best use and perhaps the only use can be obtained for this power will be pumping for irrigation.

"Coming to the matter of developing power at Arrow Rock, I find that the popular belief is that Arrow Rock must be an excellent power site—that a large amount of power can be developed there at low cost.

"Some power can be developed at that point at a reasonable cost; I refer now to the power that can be developed throughout the year, and this amounts to about 4,000 horsepower. A large amount of power can be developed during the irrigation season but at a rather high unit cost for construction plant, much higher, for instance, per horsepower than many plants that have been built in this state along the Snake River. It would be possible to develop at Arrow Rock for a short time during the height of the irrigation season, or when the reservoir is practically full, as much as 75,000 horsepower, but it would not be feasible to construct a power plant that could only be used for a few months or weeks during the year.

"The construction cost per horsepower at Arrow Rock for large development must necessarily be expensive. Besides the construction cost it is necessary to take into consideration the yearly cost of keeping the plant in a first-class condition and some of these items are as follows: Depreciation on a well built plant will amount in a year to about four per cent, interest on investment should be figured at about six per cent, insurance on plant about one per cent, taxes at about two per cent, or a total of these items of 13.5 per cent. If a power plant cost $100 per horsepower, an amount of $13.50 per horsepower per year will be required to take care of the items above mentioned.

"To this amount must be added the cost of maintenance and operation of the plant, which would be about $2 to $4 per horsepower per year, depending upon the size of the plant. In addition to these charges will be the cost of transmission lines, transformer stations, etc.

"Under the conditions prevailing at Arrow Rock, taking into account the requirements for irrigation water, which are paramount, about 4,000 horsepower can be developed throughout the year except for about ten or fifteen days in the latter part of October of extreme low-water years, when the output would drop to about 3,000 horsepower. Pipes for power purposes to the above capacity have already been installed in the dam to make possible such power development, if it is found feasible and money can be secured for it in the future.

"If a plant is built to develop about this amount of power at Arrow Rock, such a plant would tie in well with the plant at the diversion dam, as the time of minimum output for each plant is not the same, so the two working together can supplement each other; that is, each can help the other throughout its weakest period. These two plants working together could turn out about 5,200 horsepower throughout the year, which would make good returns for the project, provided a good market can be found for all-the-year-around power at reasonable commercial rates.

"It will be possible to develop a large amount of power in addition to the above amount named during the summer months, when there is a large amount of water passing through the dam for irrigation purposes, but it is doubtful if a market can be obtained for this power, which would only be available during the irrigation season, at a rate which would warrant investment in such a plant. In other words, it is possible to develop a commercial power plant at Arrow Rock if a market can be obtained at commercial rates for its power and it is probable that a market will come at some time in the future, but it is doubtful if a market can be obtained for the summer power at rates that would make it a good investment."

A Pacific Coast highway for automobiles is being linked up of the best roads and when completed by the end of next year will connect San Diego, Cal., and Vancouver, B. C. The route passes through the principal cities and towns and is entirely over hard-surfaced roads. The highway is to be extended later to Alaska.

The Position and Opportunities of the Engineer in Charge.

Frank Bailey, chief engineer of the City of London Electric Lighting Company, delivered the inaugural address before the Association of Engineers-in-Charge, London, on October 14. His subject was nominally, "The British Empire and our Work In It," but Mr. Bailey is an original thinker and we extract certain matters which have not a local significance, but have a bearing on the work of all engineers who are interested in the control and operation of plants.

The work of maintaining plant or of superintending works of construction involves details of management, specialized experience, and therefore a knowledge of men and of many handicrafts. These requirements can be fulfilled satisfactorily only by the happy combination of theory, practice and experience. Theory is useless for this purpose unless applied to practice; and practice becomes only a blind imitation of possibly obsolete methods unless controlled by theory.

Theory cannot progress without bold flights of imagination stimulated by scientific research, then comes constructive effort and creative skill involving practical experience, and finally the verdict of success—more or less work for the engineer-in-charge.

If the theory has been correctly based on facts, verified or suggested by complete research and applied to practice by the best form of design and construction, it is possible that the engineer-in-charge may relieve the monotony of his existence by keeping things clean and pouring oil into the right place, confident that all is perfect and free from the possibilities of antiquation.

The position occupied by an engineer-in-charge must depend on his own efforts. If he is content to make no progress, or improvements on existing methods, and to make no real attempt to fully grasp the requirements of the plant under his charge, he is not likely to increase the earning power of a factory by securing a larger output or any increased profit by working at a higher efficiency. If, however, a determined effort is made to secure a comprehensive grasp of the main principles of his work, coupled with a special knowledge of the smallest detail of the process of manufacture he is able to apply skilled judgment on the performance of his plant and to suggest and carry out improvements, or to advise on the replacement of the plant. The necessary courage to condemn plant is not easily acquired, as this courage must subsequently be justified by performance verifying promise. The asset value of the scrap heap will not atone for only a partial success of the improved plant, hence the engineer must be prepared to accept the full responsibility of his advice, and be blamed for any defects; in any case, he must not expect praise, for if the replacement exceeds expectations he may have to explain why such an obvious improvement did not receive earlier attention.

If improvement in process or plant results in profitable expansion of output the wealth of the nation must be increased, and the engineer-in-charge will occupy a recognized position, even in a humble capacity.

Expansion of output is necessary to meet the ever increasing needs of the markets of the world and the demand on this output will increase as the cost of production is reduced. We must admit that low cost of production, combined with excellence of quality, constitutes the strongest weapon against competition; the persuasive eloquence of the salesman may assist, but the initiation of improvements in manufacture should be part of the life work of the engineer.

A comparison of the export trade figures of Germany and the United Kingdom shows figures which do not appear creditable to the country which made the first steam engine, railway, steam turbine, dynamo, electric telegraph, submarine cable, textile machinery, etc., and we may reasonably wonder if our progress is in any way impeded by a want of foresight, intelligence, or skill. We have a government fully alive to domestic needs; a national laboratory under distinguished scientists; polytechnics and technical schools which rival the best in other countries; good supplies of raw material, and the cheapest supplies of electrical power of any country in the world; and, finally, an army of workers skilled in handicrafts, strong in physique, and always willing to earn or receive more money. The weakest link in our chain of progress appears to be the method of ascertaining the right way of going to work; sometimes it is achieved by actual experience, or, in other words, by trial and error, but rarely by systematic examination. In such an investigation the services of the chemist are generally of great value, although they are seldom appreciated except in chemical factories. Industrial chemistry can assist the engineer by defining the composition of substances, and when combined with some knowledge of engineering requirements the advice of the chemist is a good investment. In this matter the industrial chemist, with a slight knowledge of mechanical engineering, is capable of giving better assistance than the engineer with a rudimentary knowledge of chemistry; but it is essential that the engineer should place implicit faith in the chemist, and adopt the whole of his advice, as otherwise a partial remedy may introduce new troubles.

It may be urged that engineers-in-charge ought not to bother themselves about chemical work, but wait until the perfection of any process reduces the work of manufacturer to mechanical repetition. This suggestion implies that man, gifted with intelligence and the ability to think, should be content to remain a machine of beef and muscle and probably be guilty of a crime against tradition if he suggested any improvement. A pernicious doctrine of this kind cannot be beneficial to the members of this Association, or to the welfare of the country, and it would be better to risk incurring the ridicule and displeasure of those who prefer stagnation than to perpetuate antiquated or obsolete methods. So much information can be obtained by simple means of investigation that it is surprising how little encouragement is given by many business firms to practical research, or even in assisting their technical officers to collect information from kindred industries either at home or abroad.

Legislation has frequently been suggested to provide for the compulsory examination and certification of those in charge of steam boilers, etc., on land, and probably the general use of electrical power has now made this question of less interest as affecting the safety of life; but as a matter of national importance any proposal which secures encouragement for efficiency, or incentive to progress, is worthy of serious consideration. The experience of the United States has the merit of considerable variety as each state has its own method, although an attempt is now being made to get Congress to enact a general law. In eight of the states engineers' license laws are adopted; and in nine cities there are special ordinances under the control of the police, providing for the examination and license of those in charge of stationary engines. In our marine service certificates are granted by the Board of Trade after examination, but on land the only statutory provision is contained in the Boiler Explosion Acts of 1882 and 1890 which provide for an inquiry by the Board of Trade into the cause of any accident in connection with the use of steam or explosion of steam boilers. In these inquiries it is assumed that reasonable care should be exercised in placing steam boilers, etc., under the control of qualified and competent attendants, and that the design and manufacture of steam appliances have received proper attention.

Edison Day Celebrated in the Carnegie Institute of Technology.

Edison Day, the thirty-fifth anniversary of the birth of the Edison incandescent lamp, was appropriately observed in the School of Applied Industries, Carnegie Institute of Technology. The celebration was in charge of the students of the Electrical Equipment and Construction Department, a number of whom read papers covering various phases of Mr. Edison's career and wide range of inventions. The remarks were illustrated by lantern slides made for the occasion by Mr. Dodds, one of the instructors, and by practical demonstrations with suitable apparatus.

The story of Edison's youth was interestingly told by J. M. Moore; Edison's life after his twenty-first birthday was discussed by C. E. Hamman, and the history of the incandescent lamp by Fred J. Buehler, including a display of lamps, some of which are a quarter of a century old and still operable. John M. Orr explained in an interesting way the theory and construction of the nitrogen lamp, and dazzled the eyes of the audience by the rays from one of 1,200 candlepower. M. S. Sperry's history of Edison's work in the dynamo and motor field was illustrated by numerous lantern slides showing dynamos, newspaper clippings, etc., ranging from 1878 to the present day. W. C. Gloeckler proved the thoroughness and finality of Edison's work in developing the multitude of accessories and detail devices necessary to the success of his principal inventions, by showing a collection of relics of early installations. The phonograph, one of Edison's earliest inventions, was discussed by G. K. Duve, and Edison's work in connection with the telephone, of which the public knows little, was treated by W. E. Ketcham, who displayed some very old instruments, as well as some of the latest type. Clifton A. Coulter concluded the students' participation with a technical and interesting explanation of one of Edison's latest inventions, the nickel-iron storage battery. M. M. Smith was to have read a paper on the subject of "Edison and Motion Picture Inventions," but unfortunately was absent on account of illness.

T. B. A. David, who had been an interested listener to Young America's efforts, was then introduced by Mr. Calderwood, the head of the department, and held the boys spellbound with his graphic stories of his personal observations of Mr. Edison's work in the laboratory and the business world. Mr. David knew Mr. Edison when the latter was a young telegraph operator, and was later associated with him in his laboratory at Menlo Park. Mr. David was entrusted by Mr. Edison with the task of introducing the infant invention, the telephone, to the Pittsburgh public, and he told a fascinating tale of his troubles and joys in trying to keep the wires of his 50 odd subscribers from becoming crossed. Today, 35 years later, the Central District Telephone Company, then a competitor, now the successor of the Edison Telephone Company, furnishes service to 58,868 connected instruments in Pittsburgh proper, 73,588 in Allegheny county, and a total of 184,638 in the territory covered by its lines in portions of Pennsylvania, Ohio and West Virginia.

As Mr. David talked, he handled lovingly and expertly a curious object, a small switchboard with a capacity of twenty-five lines, which formed part of the equipment of one of the first telephone exchanges in Pittsburgh, and which was donated to the Electrical Equipment and Construction Department of the Institute for its growing museum.

Mr. David also displayed a photograph of Mr. Edison in the act of operating his first phonograph. The photograph was a gift, being signed "Yours truly, Thomas A. Edison, Menlo Park, N. J., October 3, 1878," and was taken in the gallery of Brady, the famous "war-time photographer," in New York.

Dean C. B. Connelley then addressed the students, giving some reminiscences of his early association with Pittsburgh's Edison—George Westinghouse.

Charles M. Ward, superintendent of the Duquesne Light Company's laboratories, presented some facts regarding the electric light and power business in Pittsburgh. He also encouraged the students by praising highly the ability and worth of students from the Electrical Equipment and Construction Department, of whom he has a number employed in the laboratories.

Souvenir portraits of Mr. Edison and a history of his life in booklet form were then distributed, and the boys departed, full of admiration for the "Wizard of Menlo Park," the great exponent of applied industries, and enthusiastic over the possibilities open to them in the field of electricity.

Institution of Electrical Engineers.

In normal times some of the local sections of the (British) Institution of Electrical Engineers are poorly supplied with papers and thinly attended. In the exceptional state of affairs consequent upon the war the outlook is still less favorable, and one section has announced its intention not to hold meetings this year. The principal meetings are of course held in London at headquarters, and here Sir John Snell delivered his presidential address on October 29. The subjects expected to receive attention at the London and other meetings between October and March are as follows: "Cables," by C. J. Beaver; "Power-Plant Testing," by W. M. Silvey; "Automatic Productive Switchgear for Alternating-Current Systems," by E. B. Wedmore; "Shape of the Pressure Wave in Electrical Machinery," by S. P. Smith and R. S. H. Boulding; and Lord Kelvin's work on gyrostatics (the sixth Kelvin lecture) by Prof. A. Gray.

National District Heating Association.

At the meeting of the Executive Committee of the National District Heating Association held at Chicago, Ill., October 29 and 30, it was decided to hold the 1915 convention of the association at Chicago, June 1, 2 and 3, with headquarters at the Hotel Sherman. The officers of the National District Heating Association are:

President, H. R. Wetherell, Central Illinois Light Company, Peoria, Ill.

First vice-president, Davis S. Boyden, 39 Boylston Street, Boston, Mass.

Second vice-president, Byron T. Gifford, American Public Utilities Company, Grand Rapids, Mich.

Third vice-president, George W. Martin, 320 Broadway, New York.

Secretary-treasurer, D. L. Gaskill, Electric Building, Greenville, O.

Manila Power Company Organizes for Philippine Hydroelectric Development.

The Manila Power Company, a Connecticut corporation, has just obtained permission to do business in the Philippines. The company is incorporated for $100,000,000 and is understood to be about to take over the Caliraya water right granted by the last Philippine Legislature to Charles M. Swift. The corporation is authorized to organize and operate hydroelectric power plants, to dispose of electric current, to acquire water rights, and to engage in other similar activities within the Philippine Islands. The incorporation papers were filed in Hartford, Conn., and the incorporators were Arthur L. Shipman, William Waldo Hyde, and A. W. Hyde.

New Marconi Station.

A receiving station, for handling radio messages direct from Norway, is being erected at Chatham, Mass., on Cape Cod, by the Marconi Company. Aerial masts 415 feet in height are being put up. These are composed of 15 and 10-foot steel sections bolted together.

New Electrical and Mechanical Appliances

Stamped-Steel Fixture Stud.

A line of sherardized stamped-steel fixture studs has been put on the market by the National Metal Molding Company, Pittsburgh, Pa. They are made from a special high-grade mild steel that has great tensile strength. Thus the manufacturer claims them to be lighter and stronger than any other fixture studs obtainable. No. 11 B & S gauge steel is used and this has sufficient thickness to permit male studs to be tapped out to make female studs; similarly, the female studs can be threaded outside to make male studs. The inside diameter of the studs is liberal enough to pass wires easily. The shape of the studs permits them to be inserted through the center knockouts of outlet boxes so as to give greater security in the mounting of heavy fixtures.

In the stamping and forming processes each stud is subjected to a severe test, so that no hard, brittle or otherwise defective studs are put out. Each stud is thoroughly sherardized. This makes it rustproof and at the same time anneals it, thus still further improving its bending qualities. In hanging fixtures, therefore, there is no danger of breaking studs while straightening the fixture. The sherardized threads are sharp and clean. The manufacturer also furnishes sherardized stove bolts for use with these studs, if desired.

National Steel Fixture Stud.

A New Electric Lantern.

A new and very convenient form of electric lantern has been placed on the market by the Merchant Engineers Corporation, 30 Church Street, New York City. It is known as the "Jove Battery Lantern" and, as shown in the illustration, consists of a highly finished sheet-metal casing that is both light in weight and strong in construction. It contains a single dry cell and is of such size that any standard No. 6 cell can be used. In renewing the cell, the cover can be quickly removed and replaced. Two handles are provided to suit the convenience of the user. The side handle permits using the outfit like a watchman's or detective's bull's-eye lantern. The bail on top enables it to be carried like a railroad man's lantern. The switch is conveniently placed. Short-circuiting of the cell is made impossible by the arrangement of the terminals, which also facilitates connecting the cell.

By using a highly polished parabolic metal reflector, the light rays are projected a long distance ahead. A small but very efficient lamp is used, thus insuring both strong, white light and long battery life.

Jove Battery Lantern.

Menominee Electric Flatiron.

Service was the keynote in the design of the electric iron which has been placed on the market by the Menominee Electric Manufacturing Company, Menominee, Mich. This is noticeable in its simplicity and ruggedness of construction. It has but few parts and these are strongly built and securely assembled. The handle is generous in size and remains perfectly cool. The connecting plug is strong, durable and well insulated. Despite its rugged build, the iron is pleasing in general appearance, the high polish of its body being very attractive.

Special care is taken in the heating element, which takes 500 watts and is guaranteed for five years. Irons are made for 110 and for 220 volts. Their cost is very reasonable, considering their high-grade construction.

The Menominee Company also makes a lady's traveling outfit, consisting of a two-pound electric flatiron that can be inverted and used like a disk stove, a folding curling iron, connecting cord, and black leather traveling case for the entire outfit. The curling iron can be heated in the body of the flatiron.

Menominee Electric Iron.

Pull-Switch Rosettes.

A new line of pull-switch rosettes has been placed on the market by Pass & Seymour, Incorporated, Solway, N. Y. The illustrations herewith show these devices with one-eighth, one-quarter and three-eighth-inch threaded and pendent Fluto caps. The pull-switch rosette in this form

Pull-Switch Rosettes With Different Styles of Caps.

becomes really a 250-watt feed-through switch. The various sizes and styles of caps make these rosettes convenient for attaching to small devices, such as small heating appliances, indirect or semi-indirect fixtures, etc. Each rosette is furnished complete with ten feet of strong black cord and composition ball.

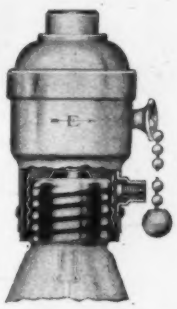
Bryant Push-Button Switch.

A new push-button switch with a substantial molded insulating cover for the mechanism instead of the usual sheet-fiber cover has been placed on the market by the Bryant Electric Company, Bridgeport, Conn. This new feature leaves nothing of a brittle nature for workmen to chip or damage before or during installation. It makes the switch dirtproof and eliminates opportunity for grounding because it is thus completely inclosed.

The supporting yoke shown to the left of the accompanying illustration is not in contact with any metal parts of the switch. Slots in the recessed ears of this yoke, used in connection with the special head screws furnished with each switch, permit any necessary adjustment.

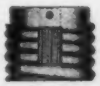
A New Locking Socket.

A new type of locking socket, known as the "Arrolock," has been placed on the market by the Arrow Electric Company, Hartford, Conn. It has been developed for all the brass-shell "Arrow E" sockets and insures against the unauthorized removal of lamps from the sockets so equipped. Thus it is not only a preventive of theft of lamps, but obviates the replacing of a lamp by one of improper size or by any appliance that should not be connected to a lighting circuit.



Partial Section of Arrolock Socket.

The new lock sockets have a simple operating mechanism which consists of a small set-screw turned in against a serrated and hardened steel clamping piece that engages the base of the lamp and positively prevents it from being turned in the socket. The set-screw is turned by a key of special construction, without which the screw cannot be reached. The latter is insulated by the socket lining, so there is no danger of shock in manipulating the key, which may be carried on the key ring. If desired, the manufacturer will drill the set-screw bushings without extra charge, so that a private seal may be attached.



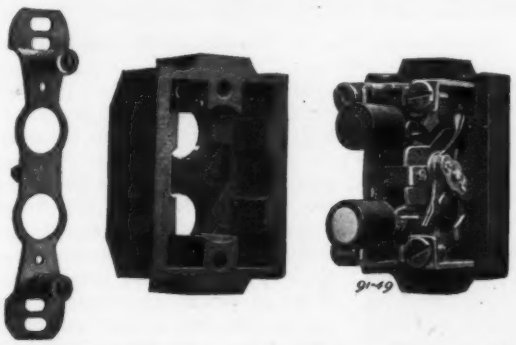
Section of Shell, Showing Clamping Piece.

The Hauck Kerosene Torch.

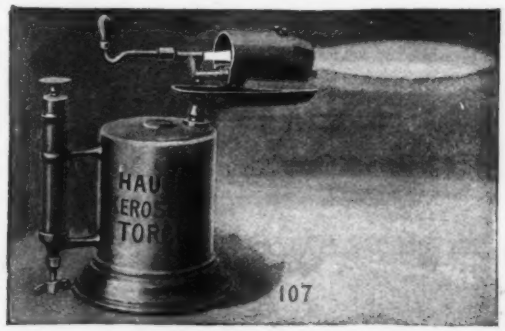
A kerosene torch of novel design has been placed on the market by the Hauck Manufacturing Company, 140 Livingston Street, Brooklyn, N. Y. It was especially designed to take the place of the gasoline torch. The most important feature is the construction of the bronze burner. The oil passageways are especially large and so arranged that only one plug has to be unscrewed in order to clean the whole burner instantly. By a special oil-regulating needle valve the flame can be adjusted to any size from 8 inches long by one inch in diameter to the finest point.

As kerosene contains more heating units per quart than gasoline, the temperature obtained with this torch is higher than that of the gasoline torch, which makes it especially suitable for brazing and soldering heavy cables, armature repair work, burning off insulation, soldering battery plugs, etc. Kerosene is also cheaper and less dangerous than gasoline.

It is also claimed that strong wind or cold weather will not affect the flame in any way and it is therefore especially recommended to linemen and electricians. The torch is also furnished in connection with a light furnace for melting solder and heating soldering coppers.



Yoke, Casing and Mechanism of Bryant Push-Button Switch.



New Kerosene Torch.

An automatic spring-tension-adjustment bushing for the face-plate screws prevents over-tightening of these screws and thus prevents buckling of the face-plate. The liability of the screw-driver to slip and mar the screw or face-plate is minimized. These springs also adjust the screw heads to the countersinks in the face-plate.

The escapement spring of this new switch performs no other function. The switch will operate even if the actuating spring is broken. The actuating spring is large in diameter and has more coils than are usually employed, insuring easy action and long life.

The screws which hold the mechanism to the base are staked to a brass strip in the groove on the back of the base before being covered with insulating wax. Thus these screws cannot be loosened.

The "out" button projects only five-sixteenths of an inch beyond the face-plate. The stroke of the buttons is only three-sixteenths of an inch, which effectively overcomes oscillation or "hanging" below the plate.

Electric Steel.

The production of steel in the United States by the electric process in 1913 amounted to 30,180 tons, compared with 18,309 tons in 1912. In 1908 only 55 tons of electric steel was produced. On December 31, 1913, the number of completed plants which were equipped for the manufacture of steel by the electric process was 19, an increase of 5 during the year.

A commercial organization at Barcelona, Spain, has prepared a list of articles formerly exported by the countries now at war to various parts of Spain. In this list are mentioned electrical fittings, appliances, etc.

The Telescribe.

A machine which brings the telephone and the phonograph into close relation, known as the "Telescribe," is the latest achievement of Thomas A. Edison, and fulfills his early prediction that the phonograph would "perfect the telephone" and furnish a means whereby telephonic messages would be recorded to furnish a verification of spoken promises and other forms of conversation. The apparatus includes a battery box containing a single dry cell, and a socket for the insertion of the telephone receiver. A small receiver is provided for the purpose of listening to the conversation while the telephone receiver is in position over the transmitter of the telescribe, the sound waves being transmitted thence to the micro-recorder of an Edison dictating machine. The wire connection for the wall socket of the lighting circuit operates the motor of the dictating machine, a switch controlling its operation being located on the telescribe. Contact between the diaphragm of the telephone receiver and the telescribe transmitter is by means of a rubber button upon which the inverted receiver presses.

A telephone message is "telescribed" in the following manner. The receiver of the desk telephone is removed from the hook and placed in the socket of the telescribe. In this way the telephone company's restriction on electrical or mechanical connections is obviated. The user then takes up the watch-case receiver and gives his call to the exchange, starting or stopping the dictating machine by means of the double-button switch on the telescribe. In this way full use of the wax cylinder surface is obtained without waste.

Thus both sides of the telephone conversation are recorded, the machine becoming an eavesdropper or third-party witness on the telephone line.

The value of the machine in commercial work is readily recognized. Brokers, purchasing agents, in fact, every one who does business by telephone, often requires a definite record of transactions, and this the dictating machine, co-operating with the telescribe, supplies. It is stated that in the United States today the telephone transmits over 60 per cent of all forms of communication, totaling over 15,000,000,000 conversations a year—as many messages as the combined total of telegrams, letters and railroad passengers. The telescribe thus becomes the ally of the most important means of communication.

A second adjunct to the dictating machine is the transophone, recently produced by Mr. Edison. This links the dictating machine to the typewriter and enables the operator to cause the dictating machine to repeat its recorded message, by touching a button beside the typewriter keyboard. By means of a magnet the wax-cylinder of the dictating machine is drawn back one thread's breadth, thus causing the machine to repeat an average of three words. If more than three words are desired repeated, the operator presses the button twice or more. The transophone saves the labor and inconvenience of reaching out and moving a repeating lever.

The telescribe and the transophone were first exhibited at the Boston Domestic Science and Pure Food Exposition, which opened in that city October 5.

Apparatus for Phonographically Recording and Reproducing Wireless Messages.

Mr. Edison Using the Telescribe.

Phonographic Wireless-Message Recorder and Reproducer.

H. M. Hammett, a Boston electrician, has devised and patented a system and apparatus by which radiotelegraph waves are recorded on the wax cylinder of a phonograph, and also intensified so as to be reproduced through the horn of the talking machine with such volume of sound as to be distinctly "read" by an operator in any part of a large room in which the receiving apparatus is located. It is also possible through a wired connection to hear the message through a horn located in any room at a distance from the receiving set.

The advantages claimed for the new devices are that the use of the head telephone may be dispensed with, and that messages may be recorded and kept for reproduction later. The use of the recording instrument also makes it possible for the operator to read messages that are being transmitted at one frequency, while the cylinder is receiving messages at a different frequency.

The radio waves are received through a series of two deForest Audions and thence carried through a system of intensifying apparatus of the inventor's construction. From this the impulses are conveyed by a wire circuit to a special 1,000-ohm receiver that fits onto the recording tube of an Edison phonograph operated by a one-sixteenth-horsepower alternating-current motor connected with the central-station lighting circuit.

A four-ohm receiver is connected to the mouth of the phonograph horn, which is located in any position apart from the talking machine itself. Both the recording apparatus and the horn are connected to the same circuit, and their operation, singly or together, is controlled by double-throw knife switches located on a switch table containing batteries and resistances connected with the circuit.

By the use of an acousticon receiver connected with a single battery installed between the step-up apparatus and itself, the receiver, placed in the throat of the horn, intensifies the sound waves which are further reproduced in louder tones through a brass horn located near the ceiling of the room.

By placing the low-resistance receiver on the transmitter of a telephone instrument, the radio vibrations can be read by an operator at a distance, and the inventor has taken this means of connecting operators whose receiving instruments have been out of order.

One of the practical applications claimed for the intensifying device is on shipboard, where a receiving "horn" can be installed in the pilot house and the ship's call noted by the officer in charge, if the operator is off duty. The use of the recording cylinder might prove of advantage in cases of legal controversy. A recording instrument that will take messages in the protracted absence of an operator is a further possibility. It is said leading radiotelegraph men have made overtures to Mr. Hammett with a view to securing his patents.

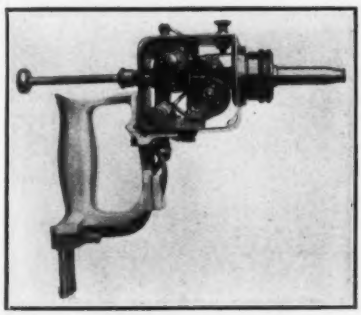
The Schoop Metal Spray.

A process for depositing upon both metallic and nonmetallic surfaces a thin metallic coating has been developed in Europe by Schoop and others, and has recently been introduced in this country by the Metals Coating Company of America, 122 South Michigan Avenue, Chicago, which owns the American rights to the patents covering this process.

The new method utilizes the principle of projecting a fine spray of the metal upon the surface to be coated. The first practical apparatus for this purpose used a large reservoir of molten metal, the drops of which were atomized by compressed air and projected with great velocity upon the base. This apparatus lacked portability and was commercially restricted to the spraying of lead and tin, which was successfully accomplished.

In a later form of apparatus the reservoir of molten metal was replaced by a container of metallic dust, which was simultaneously acted upon by heat and air pressure and projected upon the base. This apparatus is still in use for special purposes, chiefly zinc coating.

The final form of the apparatus uses solid metal in the form of wire and this is melted, atomized and projected by means of compressed air. These



Schoop Spraying Pistol.

actions are accomplished by the use of a spraying pistol, which is a compact, portable hand instrument weighing 3.5 pounds.

The spraying pistol is shown above with its right side plate removed from the box. Three hose pipes lead oxygen, hydrogen and compressed air from their respective containers to the burner tube and brass nozzle, which are concentric. Provision is made for ready control of the gases.

The wire of the metal which is to form the coating is fed to the box from a reel. The wire is pulled into the box at a rate of 12 feet a minute and issues at the opposite side into a nozzle, being driven by a friction feed apparatus geared to an air turbine. In the brass nozzle the wire passes down the core of the inner burner piece and at the end of it passes into the flame produced by the ignition of the mixture of hydrogen and oxygen, which simultaneously passes between the two burner pieces. Immediately in front of the flame zone the nozzle discharges a blast of air at a pressure of 120 pounds per square inch. This blast completes the disintegration of the wire and causes its particles to be entrained in the blast. These particles are carried forward at high velocity (about 3,000 feet per second) and impinge upon the surface to be coated, which is set up at a distance of about five inches.

The temperature of the molten metal spray at the nozzle varies, according to the wire used, from 700 to 2,000 degrees Fahrenheit, yet the object to be coated at a distance of five inches is not injured by the heat. The particles are in a solid state when they reach the article to be coated and impinge upon it with such high velocity that they are imbedded in the pores and adhere strongly to the surface. Any desired thickness from 0.001 inch upward can be built up from the deposit. Delicate fabrics can be coated without damage and the head of a match may be coated with metal without becoming ignited. The coating may be of any metal which can be obtained in the form of wire and successful commercial applications have been made with lead, tin, zinc, aluminum, copper and such alloys as brass, bronze and German silver. Deposits may be made upon metal, wood, stone, paper, cloth, silk, glass and indeed any surface desired.

The pistol itself is small, compact and portable. For its use tanks of commercial oxygen and hydrogen with reducing valves and a supply of air under a pressure of 120 pounds per square inch are required.

The dense adherent coatings made by the Schoop process have been applied in many ways. Structures of any size, especially of iron and steel, may be coated in this way and thus protected from corrosion permanently and more successfully than can be done by painting and other previous methods. Decorative coatings may be applied to any form of material. Objects used in juxtaposition to storage batteries can be given a protective coating of lead. Dynamo and motor brushes and other objects of carbon can be coated with copper for terminal connections. Metallic coatings of any desired thickness can be obtained upon mica, glass, or other insulating substances to form condenser plates, resistance units, etc. Bonding can be effected between two pieces of metal. Commutators can be built up of any desired shape and of homogeneous quality. Iron wires can be coated with copper or other metals to protect them from corrosion. Many other electrical applications will readily suggest themselves.

This process may replace electroplating and can be used in many cases

where electroplating is not feasible. Electrotyping may also be replaced by this means. Coatings can be made permanent or detachable at will and the detachable process provides a rapid and cheap method of reproducing in any metal any solid object whatever, regardless of the material of which the original is constructed.

By the use of removable cores seamless tubes of any metal and of any length and thickness may be built up. Such tube lengths can be seamlessly joined by the same process. Tubes already rolled from oxidizable metals can be coated with any other metal before leaving the mill. The thickness of this, as of any other coating, can be varried at will and is wholly under control. If desired, the surface can be polished after coating.

It is necessary that the articles to be coated be clean and free from grease in order to obtain an adherent coating. In the case of metallic substances, this is insured by prior sand blasting.

A Motor on the Water Wagon.

"What is the motor doing on the sprinkling cart?" is the question one is prompted to ask on seeing the accompanying picture. It obviously does not run the wagon, so that its use is somewhat problematical. As a matter of fact, this cart was specially designed to meet conditions found in many well-irrigated districts, as around Salt Lake City, Utah, where the photograph was taken. The cart does not obtain its supply from a fire plug, in the ordinary way, but from irrigating ditches outside the city.

Points are provided at frequent intervals along the ditches where the driver can plug the motor onto a power line. The motor then drives the centrifugal pump, also mounted on the rear of the cart, and fills up the tank. This motor application is a severe one, as the motor is subjected to considerable dust and jolting, but it has operated with entire satisfaction.

The cart was made by the Studebaker Corporation, South Bend, Ind. The motor is a three-horsepower single-phase Westinghouse machine and drives a 1.5-inch type C Worthington centrifugal pump at 1,740 revolutions per minute.

Motor-Driven Pump for Filling Sprinkler.

Electric Oven for Conditioning Yarns.

The tariff law of 1913 provides ad valorem rates of duty on cotton yarns based on their numbers. The method of ascertaining the number is prescribed as follows:

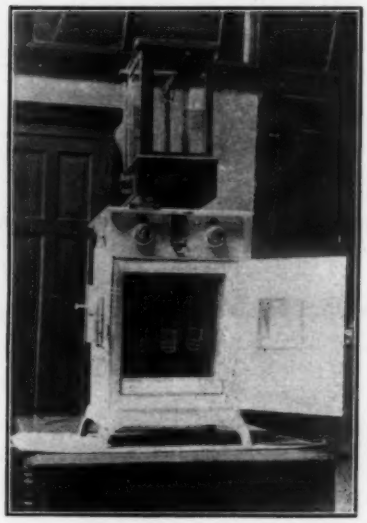
"Whenever the weight is found within 5 per cent of its given equivalent weight in the table it will be necessary to make further trials of at least four samples, and if the average weight is again found to be within 5 per cent, the sample must be conditioned, that is, dried to bone dryness and a regain of 8.5 per cent added back."

The yarn is "conditioned" by drying it in air circulating at a temperature of 110 degrees centigrade, which requires about one hour. Later on a regain of 8.5 per cent is added. The weight thus ascertained gives the number or size of the yarn and forms the basis on which duties are levied.

Cotton yarns are conditioned by the use of a Freas conditioning oven designed by Prof. Thomas B. Freas of Columbia University and Eimer & Amend, and manufactured by the Thermo Electric Instrument Company, 8 Johnson Street, Newark, N. J.

Nearly a constant temperature is maintained in the oven by the use of a regulator depending upon the expansion of an alloy rod. A small exhaust fan in the back wall, operated by electric motor, circulates the heated air. The oven contains ten small wire baskets hung from a rotary carrier and these may be revolved by a chain connected with a handle on the outside.

The samples of yarn are placed in the baskets and these may be transferred to a suspended wire comprising a part of the balance extending through the top of the oven, thus allowing the weight of the samples to be taken from time to time in the oven while hot, without exposure to the outside temperature. The heat is prevented from affecting the balance, which rests on top of the oven, by the asbestos packing in the top of the oven and under the balance. Tests of weight when the balance is cold and after the oven was heated show little variation in the two weights, but whatever slight differences may be found are allowed for in the final weighing. A window in the oven affords opportunity to observe each detail of the work. One switch in front of the oven regulates the heating current and the other controls the lamps inside the oven.



Electric Conditioning Oven.

As a working basis a standard of 840 yards of No. 1 cotton to the pound is used. This would give 8,400 yards to the pound for No. 20 two-ply yarn. Should the excessive moisture in this yarn be 4 per cent the cotton would

figure 8,077 yards to the pound, which would indicate the count of the yarn to be 19.4 or about the dividing line between 10 per cent duty and 7.5 per cent duty. Five-per-cent excess of moisture is enough to make the yarn classifiable under such a number as would mean a low duty, consequently a loss to the government. This new method of conditioning yarns is the means for an equitable adjustment of duties on yarns for all concerned.

Active Appliance Campaign in the West.

The General Electric Company is in the midst of an active campaign to put heating devices into the homes of the western towns and cities having electric light service. A definite program of demonstrations is being carried out, including several towns where heating-device equipment is exclusively General Electric, but also including those places where electric light companies handle the product of other manufacturing companies. The first demonstration in the series was in connection with the Fall Festival Electric of the Kansas City Electric Light Company, Kansas City, Mo. A. Carl Smith, heating-device specialist, connected with the St. Louis office of the General Electric Company, had charge of this demonstration and made it a very effective feature of the Kansas City utility's event. Mr. Smith sprung on this occasion a special display of which a life-belt was a conspicuous element, the belt being labeled "General Electric Company, guaranteed iron, a life-saver for every woman."

Mr. Smith, as heating-device specialist, with the Southwest as his field, arranged for October 10-22 an elaborate introduction of heating devices to the people of St. Joseph, Mo., as a co-operative response to the purchase about October 1 of a large amount of General Electric household equipment by the St. Joseph Railway, Light, Heat and Power Company. This St. Joseph event had unique features which proved their effectiveness. The demonstration of equipment at the offices of the company was confined, as a special phase of the period, to one day, October 10. The company's big display windows were elaborately decorated and filled with examples of the devices and the hundreds of visitors on that Saturday were ushered by a uniformed negro at the door.

While the heating devices were shown in operation at the offices during the succeeding week, the selling campaign was conducted by means of salesmen with wagon loads of devices visiting the housewives in their homes. The city was districted, a pair of salesmen with a wagon going into each district to show the devices at every house that had electric wiring. The city was completely covered in a little more than 10 days. The men tried to sell outright when possible, after they had demonstrated the devices; failing in this they left the device for the housewives to try for seven days. At the end of seven days these persons were again visited and the bills left for the devices or the articles taken back to the store. J. A. Janney, heating-device specialist from the New York office of the General Electric Company, and a young woman, a graduate of domestic science from the Pittsfield factory, had local charge of the General Electric's display and demonstration.

Exhibit of General Electric Appliances.

The Plattsburg Electric Light and Power Company had a demonstration October 15-29 of heating devices. The Plattsburg company handles the General Electric devices exclusively and the demonstration was arranged with the help of suggestions from Mr. Smith. The new domestic range R1 was featured. The Plattsburg company made a special offer of a four-dollar electric iron free with each contract for wiring an old house if the contract was signed during the electrical display.

The General Electric Company also participated in the elaborate electrical festival at Wichita, Kans., during the fall celebration there in the middle of October.

Perhaps the biggest electrical celebration of all in the General Electric's program this fall is that arranged for East St. Louis, Ill., when the East St. Louis Electric Light and Power Company moves into its new offices November 15. The building will be dedicated with a series of ceremonies characterized by the slogan adopted by P. C. Pullem, business manager of the East St. Louis company, and Mr. Smith acting for the General Electric Company: "Make East St. Louis Electrically Wild."

Speed Record in Transformer Manufacture.

An exceptional manufacturing record in the way of designing, building and shipping two special transformers was recently made by the Packard Electric Company, Warren, O. At noon on Monday, September 21, an order was received at the head office for two 50-kilowatt, 60-cycle transformers wound for 2,300 volts on the primary side and 600 volts on the secondary. This order came from the Bliss & Van Auken Lumber Company, Saginaw, Mich., and was accompanied by a fervent prayer that the transformers be turned out in the shortest possible time to meet very urgent necessities at the plant.

Since the transformers were to have a special secondary voltage, the engineering department of the Packard Company had to design the units before actual construction could be begun. The clock-like co-operation and speed of the different departments can be appreciated from the fact that the transformers were delivered at Saginaw complete and ready for service, on Saturday morning, September 26. Only three days and a half had been taken in designing and building the transformers from the ground up.

Fitting and Socket for Porcelain-Lined Steel Reflectors.

A new combination support and fitter for porcelain-enameled steel reflectors combined with a special socket for gas-filled tungsten lamps has been placed on the market by the Central Electric Company, 326 South Fifth Avenue, Chicago, Ill. It is known as the Type R Maxolite fitting and as indicated was designed primarily to facilitate the installation of the company's Maxolite reflectors that are coming into extensive use in shops, mills, warehouses, docks, yards, etc.

The body of the fitting consists of a strong malleable-iron reflector seat which has an upstanding neck threaded both inside and outside. The conduit serving as the fixture stem is screwed into this and a lock nut is screwed onto the outer thread. Above the reflector seat is a cork washer directly against which the reflector rests and is thus protected from scratching or cracking of its inner porcelain surface. Above the reflector is placed a lead washer,

Maxolite Reflector Fitting and Socket.

this serving to protect the outer surface of the reflector. A brass washer and lock nut on top securely hold the reflector in place.

A split porcelain socket is mounted beneath with its upper part secured to the reflector seat. This upper portion has two integral porcelain lugs that fit into corresponding slots in the lower half of the socket and serve to aline the two parts. The two halves of the socket are connected electrically and mechanically by two long contact screws shown in the accompanying illustration as projecting above the upper edge of the lower half. The shell of the socket body is so shaped as to prevent these screws from dropping out during shipment or installation. The interior of the socket is made waterproof by a thin rubber gasket placed between the two parts. An additional gasket can be provided about the neck of the lamp to make the entire fitting both waterproof and vaporproof, thus rendering it particularly serviceable where corrosive fumes and vapors abound.

On account of its relatively small number of parts, this fitting is easily installed. It is quickly wired and replacing of the socket can be readily done because of the accessibility of all parts. The fittings accommodate all standard types of reflectors for high-efficiency lamps up to 1,000 watts. Where lamps of over 300 watts are used, a mogul-base socket is supplied.

Robbins & Myers 1914 Sales Convention at Springfield, O.

The annual convention of the branch-house managers of the Robbins & Myers Company was held at Springfield, O., during the week of October 19 to 24. In addition to the managers, each branch house had one or two salesmen in attendance.

The time which was not devoted to the general conference was set aside for personal conferences by the different branch managers with the various departments of the factory organization. A schedule was prepared showing the branch managers the time assigned them for consultation with each department. In this way a great deal of time was saved in arranging dates and every manager was assured of an uninterrupted session with each department of the factory.

Group at Robbins & Myers Sales Convention.

The general conference was opened Wednesday morning by a discussion on fans. W. W. Mumma, manager of fan sales, and Eugene Newnham, engineer, led the discussion. Thursday morning was devoted to a discussion on motors. D. W. Smith, manager of motor sales, and Eugene Newnham and H. N. Stuart, engineers, led the discussion.

Thursday afternoon the convention was treated to a very agreeable surprise in the way of a talk by Mr. Kettering of the Dayton Engineering Laboratories Company, Dayton, O. His talk was full of meat and was one of the most enjoyable and effective features of the whole convention.

Friday morning was given to the subject of credits and advertising, the discussions being led by C. C. Miner, auditor and credit manager, and C. H. Clark, advertising manager.

Along with the business features of the convention there was entertainmen aplenty to prevent dull moments between sessions. Tuesday evening the visitors were entertained at the New Sun Vaudeville Theater. The actors and actresses learned about the occasion and added much to the enjoyment of the evening by a liberal use of the branch managers' names in their stage conversations. As a pleasant surprise for the visitors the usual motion-picture reel which closes the performance was omitted, and a motion-picture reel of the Robbins & Myers factory in operation was run instead.

During the entertainment Tuesday evening, the branch managers challenged the factory bowling team to a match series, to be held Wednesday evening. The series was started but one game proved to be enough for the branch managers, or Bill Williams' "peddlers" as they were named by the sporting editor of one of the dailies.

Thursday evening a motor-car trip was made to Urbana, where a chicken dinner was in readiness at the Douglas Inn. H. F. Hulse of the New York office was the star performer at this feature of the entertainment. Ike Elkas, of St. Louis, previous champion, became exceedingly jealous of Hulse's performance. As for Ike himself, his performance was very satisfactory. His overload capacity ran way above the guarantee, and but for belt slippage he would have shown considerably more than he did register.

Friday noon at the close of the general conference, the grand climax of the entertainment began. The party was assembled in the company's motor trucks and taken out in the country to the log cabin, a forest camp built by Warren Myers. The entertainment at the cabin included everything that could be desired in the way of eats, refreshments and a general good time. It was pronounced by all as a very fitting climax to the most successful sales convention the company has ever held.

Latest Approved Fittings

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

ATTACHMENT PLUGS, Fuseless.—Benjamin Electric Manufacturing Company, 120-128 South Sangamon Street, Chicago, Ill.

"Benjamin" 660 watts, 250 volts. With outlet bushing or cap holding cord without use of knot.

Approved September 25, 1914.

ATTACHMENT PLUGS, Fuseless.—The Bryant Electric Company, Bridgeport, Conn.

"Bryant" or "Perkins."

660 watts, 250 volts, catalog Nos. 3284, 3286, 3530.

250 watts, 250 volts, catalog Nos. AV-10, AV-11, AV-12 with key socket, AV-14, AV-15 with pull socket.

1 ampere, 250 volts, 3 amperes, 125 volts, catalog Nos. AV-22, AV-25 with switch rosette.

Approved September 28, 1914.

CABLES, Armored.—American Metal Moulding Company, Railroad Avenue, and Hamilton Street, Newark, N. J.

Marker: letter "D" stamped in the armor at intervals of about five inches.

Armored cables shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters, have labels attached.

Approved October 6, 1914.

CONDUIT BOXES.—The Bryant Electric Company, Bridgeport, Conn.

"Bryant" or "Perkins."

Brass covers, each with a one-thirty-second-inch fiber lining for mounting receptacles.

Catalog Nos. 374 and 377.

Approved October 6, 1914.

CONDUIT BOXES. — National Metal Molding Company, Fulton Building, Pittsburgh, Pa.

"National" sherardized pressed-steel boxes.

For rigid conduit or flexible tubing, catalog Nos. 2400-03 inclusive, 2408, 2412-13, 2500-01, 2512-15 inclusive, 2522-23, 2590, 2594, 2600-03 inclusive, 2605-08 inclusive, 2612-18 inclusive, 2622-26 inclusive, 2630-32 inclusive, 2636-38 inclusive, 2642-44 inclusive, 2648-50 inclusive, 2654-55, 2690, 2692, 2694, 2700-01, 2704-08 inclusive, 2712-18 inclusive, 2722-23, 2790, 2792, 2794, 2800, 2802, 2806, 2810, 2829, 2841-42, 2900, 2902, 2906, 2910, 3002-09 inclusive, 3012-19 inclusive.

Also the above types with covers.

Approved September 19, 1914.

FASTENERS.—National Metal Molding Company. Fulton Building, Pittsburgh, Pa.

Clamp catalog No. 2091, for use with "National" switch boxes or any other switch boxes that may be properly drilled and tapped for the clamping screw.

Approved October 1, 1914.

FIXTURES, Supports for.—National Metal Molding Company, Fulton Building, Pittsburgh, Pa.

Fixture supports, catalog Nos. 482-485 inclusive, 583 and 585.

Approved August 29, 1914.

HANGERS, Lamp and Fixture.—The Bryant Electric Company, Bridgeport, Conn.

"Bryant" or "Perkins," catalog No. 3226 (with plug-fuse receptacles) and catalog No. 3269 (with double-pole ceiling switch and plug-fuse receptacles).

Approved September 28, 1914.

HEATERS, Electric.—D. M. Steward Manufacturing Company, Chattanooga, Tenn.

Air heater, 10-20 amperes, 110 volts.

This heater should be connected by means of proper approved fittings to wiring circuit of suitable capacity for the current required and not to ordinary lighting circuits, nor ordinary lamp sockets or receptacles.

While this heater is in design and construction satisfactory for the purpose intended, it should, nevertheless, be understood that under conditions liable to be met with in practice, an air heater operating at a high temperature may be the cause of fire. In this heater no adequate means has been provided for eliminating this recognized hazard.

Approved September 18, 1914.

INSULATING MATERIALS.—Redmanol Chemical Products Company, 636 West Twenty-second Street, Chicago, Ill.

"Redmanol" molded insulating material.

No. 1, made with an organic filler, is practically non-absorptive, is not strictly non-combustible, but is unaffected by continuous moderately high temperatures, can be easily worked with tools, is of good dielectric strength and is unaffected by oils and acids.

No. 2, made with an inorganic filler has, in addition, a greater resistance to combustion and has a greater dielectric strength.

Manufacturers desiring to use this material (for small parts of electric wiring devices, especially such as require considerable mechanical strength and durability, as well as non-absorption and insulating properties of such materials as slate and marble) should submit samples in commercial form for tests.

Approved September 19, 1914.

RECEPTACLES, Standard. — The Bryant Electric Company, Bridgeport, Conn.

"Bryant" or "Perkins" metal-shell, closed or slotted bases.

Key, 250 watts, 250 volts, catalog Nos. AW-10 to AZ-10 inclusive, AW-11 to AZ-11 inclusive, BA-10, BA-11, BB-10, BB-11, BC-10, BC-11, BH-10, BH-11, BK-10, BK-11, BN-10, BN-11, BP-10, BP-11; for use on metal ceilings, catalog Nos. BL-10, BL-11, BM-10, BM-11; for use with metal molding, catalog Nos. BD-10 to BG-10 inclusive, BD-11 to BG-11 inclusive, BE-11, molding 397, molding 398. Rosette receptacles mounted on link-fuse rosette bases, 2 amperes, 125 volts, cleat, catalog Nos. BS-10, BS-11, BS-12, 24991.

Key, 660 watts, 250 volts, catalog Nos. AW-12, AX-12, AY-12, AZ-12, BA-12, BB-12, BC-12, BH-12, BK-12, BN-12, BP-12; for use on metal ceilings, catalog Nos. BL-12, BM-12; for use with metal molding, catalog Nos. BD-12 to BG-12 inclusive.

Pull, 250 watts, 250 volts, catalog Nos. AW-15 to AZ-15 inclusive, BA-15, BB-15, BC-15, BH-15, BK-15, BN-15, BP-15; for use on metal ceilings, catalog Nos. BL-15, BM-15; for use with metal molding, catalog Nos. BD-15, BE-15, BF-15, BG-15, molding 395, molding 396. Rosette receptacles mounted on link-fuse rosette bases, 2 amperes, 125 volts, cleat, catalog No. BS-15.

Turn, 250 watts, 250 volts, catalog Nos. AW-14 to AZ-14 inclusive, BA-14 to BH-14 inclusive, BK-14 to BN-14 inclusive, BP-14, BS-14.

Also all of the above types with shadeholders attached; key types with composition or insulated metal key.

Approved September 22, 1914.

RECEPTACLES, Standard. — The Bryant Electric Company, Bridgeport Conn.

"Bryant" or "Perkins" metal-shell, closed or slotted bases.

Keyless, 660 watts, 250 volts, catalog Nos. 9185, 50717, 50755, 60019, 60020; AW-13, AX-13, AY-13, AZ-13, BA-13, BB-13, BC-13, BH-13, BK-13, BN-13, BP-13; for use on metal ceilings, catalog Nos. BL-13, BM-13; for use with "Lutz" metal molding, catalog Nos. BF-13, BG-13; for use with "National" metal molding, catalog Nos. BD-13, BE-13.

Conduit box, catalog Nos. 4030 and 4055.

Rosette receptacles mounted on link-fuse rosette bases, 2 amperes, 125 volts, catalog Nos. cleat, BS-13, 24995 and 50733.

Also connection block for two-way bases, catalog No. 405.

Also all of the above types with shadeholders attached.

Approved October 1, 1914.

RECEPTACLES, Standard.—The Bryant Electric Company, Bridgeport Conn.

"Bryant" or "Perkins" porcelain-shell.

Keyless, 660 watts, 250 volts.

Cleat, catalog No. PW-73.

Concealed, catalog No. PZ-73.

Molding, catalog No. RB-73.

Conduit box, catalog Nos. RL-73, RM-73.

Sign, catalog No. 4072.

Rosette receptacles mounted on link-fuse rosette bases, 2 amperes, 125 volts, cleat, catalog Nos. 9434, 9436, 9438, 25091, 25092.

Approved October 3, 1914.

RECEPTACLES, Standard.—General Electric Company, Schenectady, N. Y.

"G. E." wall sockets, brass-shell.

Key, 250 watts, 250 volts, catalog Nos. GE471, GE473, GE475, GE477, GE479, GE481, GE483, GE485, GE487, GE489, GE491, GE493, GE495.

Keyless, catalog Nos. GE433, GE472, GE474, GE476, GE478, GE480, GE482, GE484, GE486, GE488, GE490, GE492, GE494, GE496.

Approved September 21, 1914.

ROSETTES, Enclosed Fuse.—The Bryant Electric Company, Bridgeport, Conn.

"Bryant" or "Perkins," 3 amperes, 250 volts.

Cleat, catalog No. 3423.

Concealed, catalog No. 3424.

Molding, catalog No. 3425.

All of the above for use with approved glass-tube fuses.

Approved September 28, 1914.

ROSETTES, Link Fuse.—The Bryant Electric Company, Bridgeport, Conn.

"Bryant" or "Perkins" 2 amperes, 125 volts.

Cleat, catalog Nos. 3414, 3417; switch rosette (with pull-socket mechanism) BS-25.

Approved September 28, 1914.

SIGNS, Electric.—R. C. Maxwell Company, Trenton, N. J.

Electric signs shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with the requirements of the National Board of Fire Underwriters, have labels attached.

Approved September 25, 1914.

SOCKET LININGS.—The Pairpoint Corporation, New Bedford, Mass.

"Style D" socket linings.

Linings made by this manufacturer have been examined and tested and found, in general, satisfactory for use in sockets and receptacles under the specifications of Rule 72*d* of the National Electrical Code.

Approved September 28, 1914.

SOCKETS, Standard.—The Bryant Electric Company, Bridgeport, Conn.

"Bryant" or "Perkins" metal-shell sockets.

Keyless, 660 watts, 250 volts, catalog Nos. 7402, 7404, 7406, 9392, 43390, 50,768, 99,392, AA-13, AB-13, AC-13, AD-13, AE-13, AG-13, AH-13, AK-13, AL-13, AM-13, AN-13, AP-13, AR-13, AS-13, AT-13, AU-13; electrolier, for fixture use only, catalog Nos. WA-83, WB-83, WC-83, WE-83, WF-83, WG-83, WK-83, WL-83, WM-83, WN-83, WP-83, WR-83, WS-83, WA-95, WB-95, WC-95, WE-95, WF-95, WG-95, WK-95, WL-95, WM-95, WN-95, WP-95, WR-95, WS-95.

Twin sockets, catalog Nos. 46750, 46751, 46752.

Candle socket, catalog No. 4004 when installed with casing or "candle."

1500 watts, 600 volts, catalog Nos. 4021 and 4022, for use with incandescent lamps in series on 600-volt circuits.

Also above types with shadeholders attached.

Approved September 19, 1914.

SOCKETS, Standard.—The Bryant Electric Company, Bridgeport, Conn.

"Bryant" or "Perkins" metal-shell sockets.

Key, 250 watts, 250 volts, catalog Nos. AA-10 to AH-10 inclusive, AK-10 to AN-10 inclusive, AP-10, AR-10 to AU-10 inclusive, AA-11 to AH-11 inclusive, AK-11 to AN-11 inclusive, AP-11, AR-11 to AU-11 inclusive. Electrolier for fixture use only, WA-80 to WC-80 inclusive, WE-80 to WG-80 inclusive, WK-80 to WN-80 inclusive, WP-80, WR-80, WS-80.

660 watts, 250 volts, quick make and break, single-pole, quarter-turn, catalog Nos. AA-12 to AH-12 inclusive, AK-12 to AN-12 inclusive, AP-12, AR-12 to AU-12 inclusive.

Pull, 250 watts, 250 volts, catalog Nos. 4002, 4004, 4006, AA-15 to AH-15 inclusive, AK-15 to AN-15 inclusive, AP-15, AR-15 to AU-15 inclusive; electrolier, for fixture use only, catalog Nos. WA-85 to WC-85 inclusive, WE-85 to WG-85 inclusive, WK-85 to WN-85 inclusive, WP-85, WR-85, WS-85.

Twin sockets, 4005, 4006, 4053, 4054.

Turn, 250 watts, 250 volts, catalog Nos. AA-14 to AH-14 inclusive, AK-14 to AN-14, inclusive, AP-14, AR-14 to AU-14 inclusive; electrolier, for fixture use only, catalog Nos. WA-84 to WC-84 inclusive, WE-84 to WG-84 inclusive, WK-84 to WN-84 inclusive, WP-84, WR-84, WS-84.

Also above types with shadeholders attached; key types with composition or insulated metal key.

Approved September 22, 1914.

SWITCHES, Combination Cutout.—The Bryant Electric Company, Bridgeport, Conn.

"Bryant" or "Perkins."

Double-pole snap switches combined with Edison-plug cutouts, 10 amperes, 125 volts, catalog Nos. 2,300, 2,360, 2,400, 2,599 and 2,600. Double-pole snap switches combined with cartridge-fuse cutouts, 10 amperes, 250 volts, catalog Nos. 2,534-2,536 inclusive.

Approved September 17, 1914.

SWITCHES, Combination Cutout.—The Bryant Electric Company, Bridgeport, Conn.

"Bryant" or "Perkins" combination cutout switches for car lighting, 3 amperes, 600 volts, consisting of a surface-snap-switch mechanism and a single-pole cartridge-fuse extension mounted on a porcelain base and inclosed with a porcelain cover. Single-pole, catalog No. 2315; three-point, catalog No. 2404; two-circuit, catalog No. 2405.

Approved September 19, 1914.

SWITCHES, Door.—The Bryant Electric Company, Bridgeport, Conn.

"Bryant" or "Perkins."

This manufacturer is equipped to supply door switches with labels.

The following switches are approved and labeled.

Single-pole, 3 amperes, 250 volts, 6 amperes, 125 volts, catalog Nos. 2355 and 2356.

Approved September 30, 1914.

SWITCHES, Fixture.—The Bryant Electric Company, Bridgeport, Conn.

"Bryant" or "Perkins" chandelier switches.

Adaptations of the standard Bryant pull-socket mechanism for attachment to threaded stems of canopies, clusters and chandelier bodies.

Pull switches, 3 amperes, 125 volts. 1 ampere, 250 volts, catalog Nos. AA-18 to AH-18 inclusive, AK-18 to AN-18 inclusive, AP-18, AR-18, AS-18, AA-19 to AH-19 inclusive, AK-19 to AN-19 inclusive, AP-19, AR-19, AS-19, AA-20 to AH-20 inclusive, AK-20 to AN-20 inclusive, AP-20, AR-20, AS-20, AA-21 to AH-21 inclusive, AK-21 to AN-21 inclusive, AP-21, AR-21, AS-21, WA-90, WC-90, WE-90 to WG-90 inclusive, WK-90 to WM-90 inclusive, WP-90, WR-90, WS-90, WA-91 to WC-91 inclusive, WE-91 to WG-91 inclusive, WK-91 to WN-91 inclusive, WP-91, WR-91, WS-91.

Type "O" pull switches, 10 amperes, 125 volts, 5 amperes, 250 volts, catalog Nos. 2473, 2474, 2479, 2480, 2507, 2508, 2513, 2514, 2515; 5 amperes, 125 volts. 2 amperes, 250 volts, catalog Nos. 2475, 2476, 2477, 2509, 2510, 2511; 10 amperes, 250 volts, catalog Nos. 2478, 2512.

Approved September 15, 1914.

SWITCHES, Fixture.—The Bryant Electric Company, Bridgeport, Conn.

"Bryant" or "Perkins" 0.5 ampere, 125 volts.

Key, catalog No. 2424.

3 amperes, 125 volts, 1 ampere, 250 volts.

Candle, key, catalog Nos. AA-22, AB-22, AC-22, AD-22, AE-22, AF-22, AG-22, AH-22, AK-22, AI-22, AM-22, AN-22, AP-22, AR-22, AS-22, WA-92, WB-92, WC-92, WE-92, WF-92, WG-92, WK-92, WL-92, WM-92, WN-92, WP-92, WR-92, WS-92.

Candle pull, catalog Nos. AA-24, AB-24, AC-24, AD-24, AE-24, AF-24, AG-24, AH-24, AK-24, AL-24, AM-24, AN-24, AP-24, AR-24, AS-24, WA-94, WB-94, WC-94, WE-94, WF-94, WG-94, WK-94, WL-94, WM-94, WN-94, WP-94, WR-94, WS-94.

Candle turn, catalog Nos. AA-23, AB-23, AC-23, AD-23, AE-23, AF-23, AG-23, AH-23, AK-23, AL-23, AM-23, AN-23, AP-23, AR-23, AS-23, WA-93, WB-93, WC-93, WH-93, WF-93, WG-93, WK-93, WL-93, WM-93, WN-93, WP-93, WR-93, WS-93.

Approved September 17, 1914.

SWITCHES, Knife.—The Bryant Electric Company, Bridgeport, Conn.

"Bryant" or "Perkins."

Type "A" all capacities, 250 and 600 volts.

Type "B" 30-200 amperes, 250 volts.

Approved September 28, 1914.

Current Electrical News

NORTH ATLANTIC STATES.

HARDWICK, VT.—Work on the Morrisville power station and plant is nearing completion. The water and light commissioners have now taken up the matter of a better lighting system for the village streets.

FALL RIVER, MASS.—This city is to extend its ornamental arc lighting system along main streets, by the installation of four-ampere magnetite arcs in place of the present older type of arc lamps. The Fall River Electric Light Company provides energy for the installation, but will make no charge for the supply of extra lamps over and above the number now operated, until January 1.

PETERSHAM, MASS.—This town will soon do away with gasoline street lamps and adopt electric lighting. $10,000 is to be raised among citizens to provide for an installation to be made by the Athol Gas and Electric Company. A 2,300-volt transmission line will be constructed, and group transformers installed for street lighting, and also for residence and store lighting in the town.

TAUNTON, MASS.—The matter of establishing a "white way" system in the mercantile and retail districts has been accepted by the municipal council on a tentative proposal providing that the expense of this work be borne by some source other than general taxation.

WORCESTER, MASS.—An order has been filed with the city clerk asking that the committee on street lighting consider the advisability of extending the ornamental lighting system from Wellington Street to Webster Square on Main Street. There are orders in for an extension of the system along Green, Highland, Summer and Lincoln Streets.

ATTICA, N. Y.—A municipal light and water system is under consideration. Address town clerk.

SAYREVILLE, N. J.—The Township Committee has awarded two lighting contracts, one to the Sayreville Lighting and Power Company for a period of five years, and the other to the Middlesex & Monmouth Electric Lighting and Heating Company for the lighting of the township of Morgan Heights. This contract is for a period of five years.

TUCKERTON, N. J.—The borough of Seaside Heights will purchase the Peninsula Water Company, establish an electric light plant and then consolidate the two.

SOUTH ATLANTIC STATES.

BALTIMORE, MD.—At a recent meeting of the Board of Awards, Lighting Superintendent Mohr was instructed to prepare specifications for a new contract for an electric lighting plant.

CUMBERLAND, MD.—The Monongahela Valley Traction Company is installing a power plant at Hutchinson, W. Va., about midway between Clarksburg and Fairmont. The company is preparing to meet the demand of new interurban and street car lines which the development in the Fairmont and Clarksburg fields will bring.

ROCKMART, GA.—The Water and Light Department is planning to install a 200-horsepower, four-valve engine, 125-kilovolt-ampere generator, with exciter and switchboard panel. Address J. B. Cooper, superintendent.

CLEARWATER, FLA.—A 30-year franchise has been granted to J. H. Murphy and H. A. Murphy to establish an electric lighting power plant. Address Mayor Jeffords.

MARIANA, FLA.—Light and water bonds to the amount of $35,000 have been authorized. Address mayor.

NORTH CENTRAL STATES.

GALION, O.—The City Council has empowered the director of service to use $4,000 of the electric light improvement fund for the erection of cluster lights.

HILLSBORO, O.—Sixteen 240-watt nitrogen lamps and 140 70-watt lamps of the same type will be provided for street lighting by the Hillsboro Light and Fuel Company, under an ordinance to which it is securing signatures from voters. The company's contract with the town recently expired, and a new one on the basis indicated, at a charge of $5,160 a year, is offered by the company. L.

PEMBERVILLE, O.—Construction work is about to begin on a new $9,000 municipal lighting plant. It is expected to be in operation about the first of the year.

ST. HENRY, O.—The village council has passed an ordinance for a bond issue for the purpose of installing a municipal lighting plant. It will be run in connection with the water works. The contract will be awarded November 20. J.

WEST LAFAYETTE, O.—The Lafayette Light and Power Company has been granted a franchise for furnishing light, heat and power to West Lafayette for a period of 25 years.

YOUNGSTOWN, O.—Extensive plans contemplating a comprehensive "white way" system and a more intensive illumination of both the business and residence districts are up for consideration by the city council.

ZANESVILLE, O.—The Southeastern Ohio Traction Company has been granted a franchise to furnish electric power to the citizens of Zanesville. The franchise is for 35 years. The company agrees to light the city bridges free.

SOUTH BEND, IND.—Permission has been granted the Plymouth Electric Power & Light Company by the county commissioners to construct lines through Liberty township. Work will begin in the near future.

NOKOMIS, ILL.—The mayor and city council have been authorized to issue bonds to the amount of $25,000 to establish and equip a municipal lighting plant.

OTTAWA, ILL.—The Rotary Club is back of a proposition to install a new system of lighting in the downtown and business districts.

LIBERMORE, IOWA.—The sum of $10,000 will be expended for an electric light plant. Address town clerk.

SHELBY, IOWA.—The Avoca Electric Light and Power Company has arranged to sell its plant to L. W. Boehner, a representative for the Abbott & Eaton Company, of Cleveland, O.

TOPEKA, KANS.—A proposal to issue bonds for building a municipal light plant to furnish elctricity for domestic purposes is the subject of a petition now being circulated. The petition asks that the city commissioners submit the proposition at the next city election. M.

SOUTH CENTRAL STATES.

HENDERSON, KY.—Work on the $50,000 improvement of the municipal electric light and power plant, ordered by a vote of nine members of the common council, to repair the damage done by the tornado which visited the city in the early summer, may be stopped by an injunction suit. Mayor Johnson has attacked the character of the improvements and has warned the contractors to stop work, saying they will not be paid. He is threatening to bring suit. G.

HOPKINSVILLE, KY.—The town of Princetown is contemplating the issuance of bonds to the amount of $15,000 for the purpose of building a municipal electric light plant.

IRVINE, KY.—The Town Board of Trustees objected to binding itself to exclusive rights in selling an electric-light franchise and recently declined the bid for the franchise which had been offered by C. R. Flynn. It is said that this will check the movement looking toward establishment of an electric-light plant in Irvine. G.

GAYLESVILLE, ALA.—The city contemplates installing an electric light plant. Address mayor.

BILLINGS, OKLA.—An electric light plant and waterworks system is to be installed at once.

COMMERCE, TEX.—The attorney general's department of the State has approved this city's bond issue of $4,500 for the erection of an electric light plant. D.

FREEPORT, TEX.—C. A. Jones and others have organized the Freeport Light, Water and Ice Company to erect a light and ice plant. The company has a capital of $5,000. D.

WESTERN STATES.

GERALDINE, MONT.—W. L. Kemper, of Great Falls, will build an electric light and power plant in this city, and has already begun work on the foundation. It is reported he is in the market for generating and electrical equipment. O.

RENO, NEV.—Active work on the

proposed power line from the Lahontan dam power plant to Lovelock and Rochester is to begin in the near future, according to J. L. Brown of Oakland, Cal., vice-president and general manger of the Nevada Valleys Power Company, which was the successful bidder for the entire output of electricity from the government project. The power line will be 82 miles long, and will carry a current of 60,000 volts with a frequency of 60 cycles.

FAIRBANKS, ALASKA.—The Granite Gold Mining Company, near here, Senator B. F. Millard, of this city, owner, recently announced that it intends installing new crushing machinery, electrically operated, and a new power plant. It is understood the new work will be inaugurated in the spring. O.

KAMLOOPS, B. C.—The city council will place before the registered voters of the city, at an election to be held in the near future, the proposition of issuing $50,500 in bonds, to be used as follows: $7,000 for park purposes; $3,000 for extension of water service, and $40,000 for the development of the electric light service in the city. Address Mayor Crawford for further information. O.

PARKLAND, WASH.—An estimate of $9,000 to install an electrical distributing system in this city, same to be connected with the power lines of the Tacoma Municipal Plant, was recently submitted to the Parkland Light & Water Company, at a meeting of the co-operative stockholders. A committee has been appointed to raise funds to finance the construction. O.

SPOKANE, WASH.—Public Utilities Commissioner, C. M. Fassett, has finally awarded the contract for installing an electrolier lighting system on First Avenue, between Bernard and Cedar Street, to the William E. Chase Engineering Company, low bidders, at $66,429. Electrolier posts, with pressed steel bodies, have been selected. Work will start in December, and be completed within four months. O.

BAKER CITY, ORE.—The city council has taken steps toward the calling of a bond election, the proceeds from the proposed issue to be used for increasing the municipal lighting system to include general lighting as well as streets.

PORTLAND, ORE.—Municipal Purchasing Agent Wood has been instructed by the city commission to advertise for bids for the installation of an electric lighting system in Columbia Park. Purchasing Agent Wood will also receive bids for the remodeling of lighting system in Peninsula Park. The council has asked that the work be completed in time for summer season of 1915. O.

ALHAMBRA, CAL.—The lighting committee is considering a proposition for electric current for the city, as submitted by the Little Rock Power and Water Company, of which S. P. Jewett of Alhambra is president.

ESCONDIDO, CAL.—The Escondido Mutual Water Company plans to generate power at its damsite on the San Luis Rey River for transmission to consumers in and about this city. The company has applied to the County Board of Supervisors for a franchise for a transmission line from the river to the city.

SAN DIEGO, CAL.—Plans for lighting the Point Loma district have been filed with the city council by City Engineer W. M. Rumsey. They call for 132 nitrogen-filled lamps, of 400 candlepower.

PROPOSALS.

LIGHTING FIXTURES.—Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until December 18, for lighting fixtures for the United States post office at Bryan, Tex. Plans and specifications will be ready for delivery after November 7. Address O. Wenderoth, Supervising Architect.

LIGHTING FIXTURES.—Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until December 4, for lighting fixtures for the equipment of the United States post office at Robinson, Ill. Drawings and specifications may be obtained from the custodian at Robinson, Ill., or at the office of the Supervising Architect.

INCANDESCENT LAMPS.—Sealed proposals will be received by the Board of Public Works, Fort Wayne, Ind., until November 10, for furnishing to the Fort Wayne Municipal Electric Light and Power Works, during the year 1915, various types and sizes of incandescent lamps. Minimum amount to be purchased, $2,500; maximum amount, $5,000. Address J. Wessel, Jr. clerk.

ELECTRIC PASSENGER ELEVATOR.—Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until December 1, for the installation complete of an electric passenger elevator in the United States post office and courthouse at Chickasha, Okla., in accordance with drawing and specification, copies of which may be had at the office of O. Wenderoth, supervising architect.

LAMP STANDARDS.—Sealed proposals will be opened at the office of the Supervising Architect, Treasury Department, Washington, D. C., on November 23, for furnishing lamp standards, lanterns and lamp brackets for buildings under control of the Treasury Department, in accordance with drawings and specifications, copies of which may be had by application to the Supervising Architect.

ELECTRIC FEEDERS.—Sealed proposals will be received at the office of the Superintendent of Prisons, Department of Justice, Washington, D. C., until November 20, for furnishing and delivering at the United States penitentiary at Leavenworth, Kans., electric feeders for light and power, in accordance with specifications. Copies of specifications together with further information may be secured by application to F. H. Duehay, superintendent of prisons, Department of Justice.

LIGHTING FIXTURES.—Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until December 17, for the construction complete, including mechanical equipment, lighting fixtures, etc., of a two-story and basement fireproof building, covering 6,800 square feet of ground area, for the United States post office at Glen Falls, N. Y. Drawings and specifications may be obtained after November 7 from the custodian at Glens Falls, or at the office of the Supervising Architect.

WIRING.—Sealed proposals, in duplicate, will be received at the Department of the Interior, Washington, D. C., until November 21, for furnishing all labor and material (unless otherwise specified) which shall be required in rewiring the first floor and basement of the Patent Office Building, Washington, D. C., in accordance with specifications, copies of which may be secured by application to the chief clerk of the Department of the Interior. Proposals should be securely enveloped, marked "Proposal for Rewiring Patent Office Building," and should be addressed to the Secretary of the Interior.

ELECTRICAL EQUIPMENT, NAVY DEPARTMENT.—Sealed proposals will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until November 24, for furnishing the following electrical equipment: 50,000 feet portable, stranded ship-lighting cable, 4,107 circular mils; 38,000 feet incandescent-lamp cord, 2,580 circular mils, 500-foot coils; 20 alternating-current, single-phase, induction, 16-inch, 110-volt, 60-cycle fans; 3,700 pounds weatherproof, triple-braided wire, all as per Schedule 7515; and 300 receiver cords for double-head radio headgears; 36 headgears, for radio-receiving sets, United States Navy standard; 18 portable ventilating sets, one-quarter horsepower, 125-volts, and spare armatures and field coils; 3,900 feet armored, portable double-conductor wire; miscellaneous assortment of double-cotton and single silk-covered magnet wire; 1,300 feet rat-tail, rubber-insulated wire for aerials; 34,000 feet leaded and armored twin-conductor wire, soft steel, galvanized, 4,000 circular mils; 55,000 feet twin-conductor wire, plain, 4,000 and 30,000 circular mils, all as per Schedule 7517. All of the above items are for delivery at the Navy Yard, Brooklyn, N. Y. 400 interior switch and receptacle fittings, double-pole, complete with handles, as per Schedule 7517, for delivery at the Navy Yard, Charleston, S. C.

FOREIGN TRADE OPPORTUNITIES.

[Addresses may be obtained by writing (mentioning file number) to the Bureau of Foreign and Domestic Commerce, Washington, D. C., or to the nearest of its branches at Boston, New York, Atlanta, Chicago, New Orleans, Seattle and San Francisco.]

NO. 14,158. ELECTRICAL SUPPLIES.—An American consul in Great Britain advises that a firm in his district is open to purchase, immediately after testing samples, arc-lamp carbons for bioscope and stage arc lamps. The firm is also interested in heat-resisting insulators of its own design. Samples are desired of water-tight screw holders for electric sign work.

NO. 14,178. WIRE.—An American consul in the United Kingdom transmits a letter from a company in his district which is desirous of getting into touch with manufacturers of wire of every description, including brass, copper, phosphor bronze, lead composition, steel, etc. A list of the principal kinds of wire the company is interested in has been forwarded, and a copy of this list may be had on application to the Bureau of Foreign and Domestic Commerce and its branch offices.

NO. 14,187. HARDWARE AND ELECTRICAL SUPPLIES. — An American consular officer forwards the name of an American now residing in South America who desires to represent an American exporting house handling a general line of hardware and electrical supplies. These lines are especially desired, but other good lines will be considered. The man

wishes to cover all of South America as a traveling representative on a salary and commission basis. He has had nine years' experience in that country, and speaks Spanish. American references are submitted.

NO. 14,193. MACHINERY.—A business man in Europe informs an American consul that, in view of the suspension of negotiations with a German house for certain machines intended for a new factory, he desires to receive descriptive matter, prices, etc., from American firms for a 20-horsepower three-phase electric motor milling machine for grinding ocher to consistency finer than flour, with a capacity of 1,100 pounds per hour, electromagnet for separating impurities from ocher, and an oven for burning ocher. Prompt replies are desired. This gentleman also seeks correspondence with manufacturers of typesetting machines with a view to purchasing four machines.

NO. 14,196. CARBONS.—An American consular officer in England reports the name and address of a firm in his district which is desirous of corresponding with American manufacturers of arc-lamp carbons with a view to purchasing in considerable quantities.

NO. 14,215. ELECTRICAL VACUUM CLEANERS.—A firm in the United Kingdom advises an American consular officer that it desires to secure an agency for an American-made electrical vacuum cleaner.

NO. 14,217. TELEPHONES.—An American consular officer in Great Britain reports the name and address of a firm that desires to communicate with American manufacturers of telephones, with a view to securing the English representation for the sale of such goods.

NO. 14,255. ELECTRICAL NOVELTIES, ETC.—An American consul in South America reports that an importer in his district desires to establish business connections with American manufacturers of electrical novelties, plated silverware, and bazar novelties. Correspondence may be in English.

NO. 14,268. ELECTRICAL SUPPLIES.—An American consular officer in the United Kingdom has transmitted a report, together with blue prints, from a firm in his district that is desirous of forming connections with American manufacturers of electrical supplies and steel water pipes. Copies of the full report and blue prints may be had on application to the Bureau of Foreign and Domestic Commerce and its branch offices.

FINANCIAL NOTES.

William P. Bonbright & Company have received returns from 25 public utility corporations for August, 1914, and these show increases of 7.2 per cent in gross and of 15.6 per cent in net earnings over August, 1913. Many of these companies operate extensive systems of subsidiary properties, and practically every section of the country is represented in the reports. Reports from the same companies for September, 1914, the second month of the European war, are not yet complete, but the figures so far received indicate larger ratios of increase in gross and net for that month than for August.

Dividends.

	Term	Rate	Payable
Boston Elevated	Q	1.5%	Nov. 16
Central States Elec., common	Q	1%	Nov. 19
Detroit United Ry.	Q	1.5%	Dec. 1
Illinois Traction, com.	Q	0.75%	Nov. 15
Mobile Electric, pfd.	Q	1.75%	Nov. 16
Ohio Traction, pfd.	Q	1.25%	Nov. 2
Tampa Electric	Q	$2.50	Nov. 16

Reports of Earnings.

COMMONWEALTH POWER, RAILWAY & LIGHT.

Income account for year ended September 30, 1914:

	1914	1913
Earnings on stocks owned of subsidiary	$2,490,686	$1,716,358
Miscellaneous earnings	514,064	232,822
Total gross earnings	3,004,751	1,949,180
Expenses and taxes	120,348	85,938
Interest charges	651,804	258,872
Net income for dividends	2,232,598	1,604,368
Preferred dividends	960,000	610,000
Surplus for common dividends	1,272,598	994,368

The statement includes earnings from May 1, 1913, on the additional stocks of subsidiaries acquired on that date. Surplus for year ended September 30, 1914, was at rate of 8.21 per cent on $15,500,000 common stock.

GREAT WESTERN POWER.

	1914	1913
September gross	$ 226,332	$ 223,330
Net after taxes	178,291	149,189
Surplus after charges	76,579	50,422
Balance after guaranteed preferred dividends	64,079	37,922
Twelve months' gross	2,684,042	2,651,089
Net after taxes	1,963,533	1,839,383
Surplus after charges	770,313	704,910
Balance after guaranteed preferred dividends	620,316	554,910

PERSONAL MENTION.

MR. ROBERT MONTGOMERY, manager of the commercial department of the Louisville Gas and Electric Company, addressed the local Rotary Club at its last meeting on the plans and work of the Louisville Gas and Electric Company. He went into some detail as to the improvements the company is making and its plans for the future.

MR. ARTHUR ATWATER KENT, of Rosemont, Pa., has been awarded the John Scott Legacy medal and premium for his "Unisparker" by the City of Philadelphia, acting on the recommendation of the Franklin Institute. The Unisparker is an essential element of the Atwater Kent ignition system for automobiles and consists of a contact-breaker, governor and distributor arranged in one structure.

MR. FRANK W. HALL has been appointed sales manager of the Sprague Electric Works, New York. Mr. Hall has been associated with the Sprague organization for the past 19 years, occupying various positions of responsibility in the engineering and commercial departments. More recently he was manager of the Philadelphia office and subsequently manager of apparatus sales at the general office of the Sprague Works, 527 West Thirty-fourth Street, New York City.

MR. R. E. KNOX, formerly with the General Electric Company, later inspector at Indianapolis of the Indianapolis Inspection Bureau, has been appointed electrical and hydraulic inspector for the Kentucky Actuarial Bureau, the appointment, effective November 15, having been announced by Manager Clem E. Wheeler. Mr. Knox will have two electrical inspector assistants and this will enable the bureau to cover the whole of the state, a thing that has not been done heretofore.

GEN. GEORGE H. HARRIES, vice-president of H. M. Byllesby & Company, and president of the Louisville Gas & Electric Company, has been elected president of the Omaha Electric Light & Power Company, to succeed MR. FRED A. NASH, who has retired because of ill health. While the Byllesby company is not financially interested in the Omaha company, General Harries will not retire from any of his connections with H. M. Byllesby & Company.

MR. CHARLES R. UNDERHILL, chief electrical engineer of the Acme Wire Company, New Haven, Conn., lectured on the subject of electromagnets before the American Institute of Electrical Engineers Branch of Purdue University on October 27, and before the American Institute of Electrical Engineers Branch of the Ohio State University on October 30. This year Mr. Underhill has many new slides showing the results of oscillograph tests of electromagnets with plungers or armatures, both stationary and in motion.

MR. ELMER A. SPERRY, of New York,, N. Y., has been awarded the John Scott Legacy medal and premium for his "gyrocompass," by the City of Philadelphia, acting on the recommendation of the Franklin Institute. On battleships under action the shifting of large masses of magnetic material precludes the use of the magnetic compass, and even on ordinary iron vessels the material of the ship and its disposition must be compensated for. The gyrocompass is entirely non-magnetic and is not affected by the proximity of iron. Mr. Sperry is a pioneer in the electrical industry, and his name and fame are closely associated with many developments which have been placed in practical operation during the past 30 years. His friends will be glad to know of this signal honor which has thus been accorded to him.

MR. CHARLES L. BENJAMIN, advertising manager of the Cutler-Hammer Manufacturing Company, Milwaukee, Wis., was the guest of honor at the meeting of the Advertisers' Club of Milwaukee, on Tuesday, October 27. This meeting was unique in that it celebrated the last gathering at the old club headquarters at 221 West Water Street. As a fitting climax to all the best efforts of the past Mr. Benjamin, a former president of the club, was chosen as the principal speaker. His subject was entitled "Business Building Through the Business Press." This address, delivered originally at the convention of the Federation of Trade Press Associations in Chicago on September 25, is conceded to be the most classical utterance not only on the subject of business building through the business press, but on the broad general subject of advertising that has been produced to date.

OBITUARY.

MR. ISAAC BLAUVELT, manager of the collection department of the New York Edison Company, died suddenly while at work on October 30, of heart disease. Mr. Blauvelt was 55 years of age, and had been with the Edison company for 18 years.

MR. JOHANNES DE LA MOTTE, manager of the American Telegraph Company during the regime of Jay Gould and General Thomas T. Eckert, died on October 30 at his residence in Brooklyn, N. Y., in his seventy-sixth

year. He was connected with the telegraph service in Germany before coming to this country. Upon his arrival in this country he became general manager of the old Atlantic & Pacific Telegraph Company, later on joining forces with Mr. Gould and General Eckert. Mr. De La Motte retired in 1902.

MR. NATHAN E. CHURCH, an inventor and electrical engineer, died last week at his home at Pittsfield, Mass., at the age of 44. He was born at North Petersburg, N. Y., and in his early life was engaged in the business of silver and nickel plating at Troy. He then entered the employ of the General Electric Company, at Schenectady, where he also operated in real estate. Coming to Pittsfield, he became interested in real estate development, besides conducting experiments in electrical lines. He recently patented an electric brake for automobiles and several devices adopted by the General Electric Company. He married Bertha E. Paul, of Round Lake, N. Y., who, with two sisters, survive him.

MR. JOHN KILGOUR, a pioneer public utility magnate in Cincinnati, and one of the most prominent business men in the city, died at his home on October 30, just before reaching his eighty-first birthday, which would have fallen on November 1. He had been ill for only a short time, contracting a severe cold about a week before his death, while on a trip to his office on business, resulting in pneumonia, which was the immediate cause of his death. Since 1882 Mr. Kilgour had been president of the Cincinnati Street Railway Company, owning the city railway lines operated by the Cincinnati Traction Company under lease, and had been a prominent figure connected with the traction interests of the city since 1873, when a line in which he was interested with his brother Charles was consolidated with various others to form the Cincinnati Street Railway Company. When the telephone service was first organized in Cincinnati, Mr. Kilgour was invited to take part in the work, and has ever since been largely interested, being president of the Cincinnati Bell Telephone Company up to about two years ago, his son Bayard succeeding him. He retired from active participation in business about five years ago, but retained interest in numerous concerns, his mind remaining as active as ever. Among the companies in which he was interested, besides those mentioned, were the Toledo, Bowling Green & Southern Traction Company, of which his son Charles is president, and the Cincinnati & Hamilton line.

DATES AHEAD.

National Association of Railway Commissioners. Annual meeting, Washington, D. C., November 17. Secretary, W. H. Connolly, Washington, D. C.

American Society of Refrigerating Engineers. Annual meeting, New York City, November 30-December 1. Secretary, W. H. Ross, New York, N. Y.

American Society of Mechanical Engineers, New York, N. Y., December 1-4. Secretary, Calvin W. Rice, 29 West Thirty-ninth Street, New York, N. Y.

American Institute of Chemical Engineers. Seventh annual meeting, Philadelphia, Pa., December 2-5. Secretary, J. C. Olsen, Polytechnic Institute, Brooklyn, N. Y.

American Mining Congress. Seventeenth annual session, Phoenix, Ariz., December 7-11. Secretary, J. F. Callbreath, Denver, Colo.

American Association for the Advancement of Science. Annual meeting, Philadelphia, Pa., December 28, 1914, to January 2, 1915. Secretary, L. O. Howard, Washington, D. C.

Western Association of Electrical Inspectors. Annual meeting, Minneapolis, Minn., January 26-28, 1915. Secretary, W. S. Boyd, Chicago, Ill.

With the Electrical Manufacturers

The American Circular Loom Company announces the removal of its main office to 90 West Street, New York.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has received an order from the Boston Elevated Railway Company for two quadruple equipments of No. 306 motors and type HL unit switch control for use on two new snow plows which are being built so as to be ready for the winter season.

The Western Electric Company, 463 West Street, New York City, is distributing a new booklet entitled "An Electrical Christmas." This will be furnished to central stations and electrical dealers to assist them in making 1914 a record-breaker for the sale of practical gifts. Copies will be furnished to those interested upon request.

General Electric Company, Schenectady, N. Y., has issued from its advertising department the Christmas number of the "Electrical Advertiser." This issue is replete with sensible suggestions regarding seasonable advertising of electrical products. It is full of good dealer helps, which should be made available by everyone interested in building up a big demand for electrical gifts for the holiday season.

The Leeds & Northrup Company, 4901 Stenton Avenue, Philadelphia, Pa., has issued bulletin No. 232A, which describes a new portable type of D'Arsonval galvanometer with suspended moving coil. A feature of this is its facility of repair. Another new bulletin is No. 402, which is devoted to resistance standards designed and built in accordance with recommendations of the Bureau of Standards. These range from 1 to 10,000 ohms. Special kerosene oils are provided for these standards.

The Davis Slate & Manufacturing Company, 608 East Fortieth Street, Chicago, is furnishing the slate for a large switchboard which is being built by the William Wurdack Electric Manufacturing Company, St. Louis, for the new power plant of the St. Louis Water Works. The company is also furnishing the States Electric Company with the slate for the switchboard in the new DeWolf Building, Chicago.

"The Electrician" Printing & Publishing Company, Limited, 1 Salisbury Court, Fleet Street, London, Eng., is preparing the 1915 edition of "The Electrician Electrical Trades' Directory and Handbook," which has now completed its thirty-second year. This volume will contain carefully compiled lists of British, colonial and foreign electrical engineers, electric contractors, electrochemists, metallurgists, manufacturers, instrument makers, central stations, electric railway, telegraph and telephone companies; useful technical and commercial tables and engineering data relating to electric light and traction, power transmission, industrial applications of electricity, telegraphs and telephones, wireless telegraphy, etc.; and an interesting biographical section.

The Barber-Dwinnell Electric & Manufacturing Company, 600 East Fifteenth Street, Kansas City, Mo., has ready for distribution two publications devoted respectively to a description of electric lighting plants for town and country residences, public buildings, business houses and small cities, and electric light plants for moving-picture work. This company manufactures storage batteries for central-station service, portable automobile batteries and other electrical specialties. The company is also agent for the Century Electric Company, St. Louis, Mo., the Northwestern Electric Manufacturing Company, Milwaukee, Wis., and the Independent Electric Manufacturing Company, Milwaukee, Wis. It does no retail business and sells exclusively to the trade. The company announces that on both of the lines described in the new catalogs it is doing an excellent business.

The Electrical Engineers Equipment Company, 711-715 Meridian Street, Chicago, Ill., has published three bulletins, Nos. 101, 102 and 103, devoted respectively to a description and illustrations of disconnecting switches of the indoor and outdoor and pole-top types; cable bells for all voltages and in all shapes for inside and outside and underground service, and bus bar supports built to carry flat, round and tubular buses for flat surface and pipe mounting, with either solid or adjustable bases and for all voltages. An interesting feature of each of these bulletins is a reproduc-

tion of illustrations showing the equipment of this apparatus in typical installations. The Electrical Engineers Equipment Company has successfully met the demands for some of the largest power installations which have been developed in recent years. Bulletin No. 103 is devoted to busbar supports, is printed in colors and makes up one of the handsomest pieces of trade literature that has been issued for some time.

Record of Electrical Patents.

Issued by the United States Patent Office, October 27, 1914.

1,114,719. Terminal Connector. C. W. Beck, assignor to Michigan Motor Specialties Co., Detroit, Mich. A sleeved wire terminal fits into a connecting socket.

1,114,725. Means for Determining Time Intervals in Telephone Systems. W. G. Blauvelt, assignor to American Telephone & Telegraph Co. Special motor mechanism for a sequence switch.

1,114,727. Electric Motor and Pump Connected Thereto. J. F. Breeze, assignor to Gwynnes, Limited, London, England. Inlet water for direct-driven centrifugal pump cools the motor casing.

1,114,733. Electric Furnace. W. N. Crafts, Oberlin, O. Induction furnace, part of whose secondary circuit is closed by the fused metal.

1,115,759. Windmill-Power Plant. A. H. Heyroth, Great Falls, Mont. Includes generator, storage battery and special governor and switch for the generator.

1,114,760. System of Electrical Supply. A. H. Heyroth. Amplification of above, with special electromagnetic control for generator field rheostat.

1,114,766. Inherent-Power Return Signal Mechanism. W. K. Howe, assignor to General Railway Signal Co., Gates, N. Y. Polyphase induction motor moves the semaphore from normal biased position to operative position.

1,114,770. Trolley-Wheel Mount. G. G. Jones, Cleveland, O., assignor of one-half to R. H. Riffe. Has slidable journal.

1,114,788. Automatic Draft-Regulator. R. P. Mercer, Burlington, Iowa. Includes thermostatically controlled electric motor.

1,115,798. Drum. C. F. Obermaier, York, Pa. Bakelite-covered drum for use in vulcanizing rubber-covered cables and wires.

1,114,802. Storage Battery. W. E. Poole, Chicago, Ill. Has special filler plug and vent in cover.

1,114,805. Electrical Pressing Iron. A. E. Reimers, New York, N. Y. Heating element is subdivided into series sections governed by switch.

1,114,813. Safety Switch. H. B. Shreve, assignor to Chicago Safety Appliance Co., Chicago, Ill. For elevator doors and the like.

1,114,823. Electropneumatic Control-Valve. W. V. Turner, assignor to Westinghouse Air Brake Co., Pittsburgh, Pa. For air brake.

1,114,831. Electric Switch. C. G. White, Detroit, Mich. Has contacts on the peripheries of cylindrical drums.

1,114,840. Wireless Telegraphy. W. C. Woodland, assignor to Packard Electric Co., Warren, O. Polyphase alternator with rotary distributor for effecting successive discharge of the condensers through a helix.

1,114,842. Attachment for Telephone Stands. L. E. Wright, Fairgrange, Ill. For holding receiver to the ear.

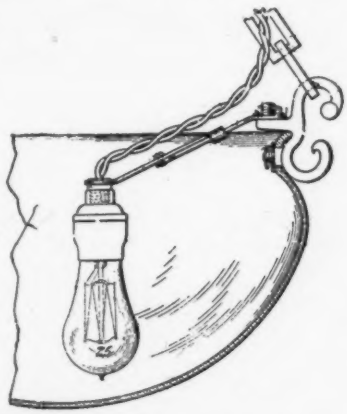
1,114,845. Electric Relay. H. D. F. Arnold, assignor to Western Electric Co. Provides means to prevent the maintenance of the blue haze in an Audiom detector.

1,114,872. Electrical System of Distribution. S. H. Everett, Jr., Brooklyn, N. Y., assignor to Gould Storage Battery Co. Provides means for balancing the load between generator and storage battery.

1,114,902. Telephone Receiving Instrument. T. B. Miller, assignor of one-half to Smith Cannery Machines Co., Seattle, Wash. Special arrangement of magnet core and coils.

1,114,904. Printer for Printing-Telegraph Systems. D. Murray, assignor to Western Union Telegraph Co., New York, N. Y. Special typewriter control.

1,114,905. Printing-Telegraph System. D. Murray, assignor to Western



1,115,206.—Lamp Support.

Union Telegraph Co. Relates to the control of the selectors.

1,114,939. Selective Signal System. W. R. Tomlin, Fort Collins, Colo. Relates to special cutout switches.

1,114,953. Arc-Light Electrode. A. V. Wilker, assignor to National Carbon Co., Cleveland, O. Contains cerium silicide.

1,114,976. Electric Lamp. C. H. Fischer, Cincinnati, O. Automobile headlight.

1,114,982. Working Submarine Cables. J. Gott, assignor to Commercial Cable Co., New York, N. Y. Provides automatic means for reversing the connection of battery to line.

1,114,988. Electrical Switch. B. D. Horton, Detroit, Mich. Ironclad switch that may be locked in open position.

1,115,018. Storage Battery. W. E. Poole, assignor to Rex Battery Co., Chicago, Ill. Has sloping vent tube.

1,115,022. Deflated-Tire Detector. H. C. Quick, assignor to S. Stewart, San Francisco, Cal. Electric alarm.

1,115,027. Electrode. R. L. Seabury, assignor to National Carbon Co. Cored carbon furnace electrode, the two parts of which are separately formed and then baked together.

1,115,032. Electric-Lamp Fitting. J. C. Stearns, Worcester, Mass. Special ferrule connector for automobile headlight.

1,115,033. Electric Lamp. J. C. Stearns. Mounting of socket in headlight.

1,115,050. Lamp-Shade Holder. C. H. Bissell, assignor to Crouse-Hinds Co., Syracuse, N. Y. Comprises a series of spring jaws about the lamp socket and a clamping nut turning on the threaded surface of the jaws.

1,115,053. Telephone Receiver. W. H. Cotton, Chicago, Ill. Special mounting of diaphragm.

1,115,075. Electric Cooker. M. L. Keagy, Canton, O. A resistance element is heated to incandescence.

1,115,084. Trolley-Wheel Mount. B. Milewski, Kent, O. Flexibly mounted in the harp.

1,115,091. Protective Switch-Box. T. E. Murray, New York, N. Y. Box is divided into two compartments, one for switch and the other for cutouts, the latter being closed by sliding cover.

1,115,092. Electric Lock-Switch. W. C. Neahr, Denver, Colo., assignor to Protective Signal Mfg. Co. Key-controlled mechanism for operating the switch.

1,115,103. Advertising Apparatus. C. R. Pierce, Washington, D. C. Includes electric lamp.

1,115,114. Connector for Electric Conductors. H. H. Russell, assignor to Electric Specialties Co., Chicago, Ill. Includes split metallic spring sleeves and spiral springs.

1,115,130. Permutation Switch-Lock. E. E. Theis, Dayton, O. Brushes engage the peripheries of metallic drums with insulating segments.

1,115,135. Electric Terminal Connector. F. Wagner, Natrona, Pa. Has hinged jaws.

1,115,147. Electric Fan. H. L. Zabriskie and F. Diehl, assignors to Diehl Mfg. Co., Elizabeth, N. J. Gear-operated oscillating mechanism.

1,115,154. Electrical Distribution System for Automobile Control. V. G. Apple, assignor to Apple Electric Co., Dayton, O. For electric starter.

1,115,166. Hanger for Lighting-Fixtures. F. M. Brooks, New York, N. Y. For clamping the edge of the bowl of indirect or semi-indirect fixtures.

1,115,174. Coherer Discharge-Indicator. E. E. F. Creighton, assignor to General Electric Co. Comprises a coherer, a decoherer, a device for indicating the coherence of the former, and means for preventing the decoherer from operating until the indicating device has operated.

1,115,206. Support for Incandescent-Electric-Lamp Sockets. W. R. Kahns, assignor to J. H. White Mfg. Co., Brooklyn, N. Y. For mounting lamps in indirect or semi-indirect bowls. (See cut.)

1,115,207. Motor-Driven Rural Mail

Car. A. T. Kelsey, St. Charles, Minn. Electrically driven and controlled suspended car.

1,115,220. Rotary Field-Magnet with Two Poles. F. Ljungstrom, assignor to Aktiebolaget Ljungstroms Angturbin, Finsang, Sweden. Winding consists of U-shaped sections connected in a helical series in combination with a core having dovetailed engagement direct with the section.

1,115,249. Means for the Production of Long Continuous Electric Arcs. O. Schonherr and J. Hessberger, assignors to Norsk Hydroelektrisk Kvaelstofaktieselskab, Christiana, Norway. Comprises a tube with a hollow electrode at each end and means for introducing gas at each end.

1,115,251. Method of Operating Electromagnetic Striking-Tools by Means of Alternating Current. L. Sehuler, Berlin-Lichterfelde-West, Germany. Consists in supplying strong impulses for the working stroke of the armature, weak impulses of the opposite kind for cancelling the residual magnetism and pauses without current for returning the armature.

1,115,264. Oil Switch. E. B. Wedmore, assignor to General Electric Co. Special locking toggle and link mechanism.

1,115,278. Ship's Engine-Room Signal. O. K. Bogstrand, New York, N. Y. Includes auxiliary electric signal system.

1,115,283. Electric Clock. L. Cerf, New York, N. Y. Has solenoid-operated actuating ratchet wheel.

1,115,286. Electropneumatic Air-Brake System. J. P. Costelloe, Medicine Hat, Alberta, Canada. Electrically controlled valve.

1,115,289. Alternating-Current Dynamo-Electric Machine. L. Dreyfus and F. Hillebrand, assignors to General Electric Co. Polyphase commutator machine with polyphase compensating winding connected to the brushes and a synchronous motor connected in shunt with the brushes.

1,115,301. Electrical Meat-Block Cleaner. A. W. A. Friberg, Jamestown, N. Y. Motor-driven scraping brush with receptacle for the scrapings.

1,115,317. Preparing Electrodes for Electric Welding or Soldering. O. Kjellberg, Gotenborg, Sweden. Consists in mixing together in a finely powdered state $CaCO_3$, K_2CO_3, ZrO_2, MgO, C, $KNaSiO_3$, B_2O_3 and HAl SiO_4 with a liquor to a paste, dipping therein an iron rod until it is coated with the paste and leaving the coated rod to dry.

1,115,324. Telephone Release-Insuring Means. T. G. Martin, assignor to Automatic Electric Co., Chicago, Ill. Automatic signal to show when the connection to the automatic switch is broken without releasing the switch.

1,115,339. Electric Message-Carrier. B. P. Schneider, assignor of one-half to J. B. Fitzgerald, Norfolk, Neb., Motor-driven store-service system.

1,115,340. Canopy Insulation. G. J. Scholl, assignor to Kelting Electric Co., New York, N. Y. A resilient split ring of insulating material U-shaped in cross section covering the rear edge of a canopy.

1,115,348. Rivet-Head-Cutting Machine. W. M. Taylor, Cleveland, O., assignor of 49 per cent to J. Hlatky, Has the driving motor inclosed within the casing.

1,115,349. Signal System. S. C. Venners, New York, N. Y. Includes auxiliary transmitter on telephone line.

1,115,350. Lawn-Mower. T. D. Vincent, Pittsburgh, Pa. Driven by electric motor.

1,115,351. Process of Separating Metals from Ores. H. A. Wagner, East Orange, N. J. Electrolytic process for extracting copper, zinc and the like.

1,115,352. Dynamo-Electric Machine. M. Walker, assignor to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Armature for commutator machines has main coils and auxiliary coils having correspondingly located parts but only one-half the length of the main coils.

1,115,359. Electric Burglar-Alarm System. J. P. Williams, New York, N. Y., assignor to Electric Bank Protection Co. Has a main and a supplementary electric protective system.

1,115,360. Automatic Control of Motors. R. B. Williamson, assignor to Allis-Chalmers Mfg. Co. Motor-generator system with means for causing the generator to run at a speed that varies inversely as that of the motor.

1,115,363. Mooring for Buoys. E. C. Wood, assignor to Submarine Signal Co., Waterville, Me. One of the mooring cables consists of electric conductors connected to the anchorage.

1,115,364. Automatic Train Control for Cable Signals. B. F. Wooding, Denver, Colo. Electrically operated bell and whistle.

1,115,386. Lighting Fixture. P. A. Bredsvold. St. Louis, Mo. The reflector is divided into a number of compartments for directing the light into different directions.

1,115,396. Alarm Attachment for Clocks. H. W. Christensen, Monmouth, Ill. Electric alarm.

1,115,406. Dynamo-Electric Machine. J. L. C. Davis, assignor to Westinghouse Electric & Mfg. Co. Means for ventilating the motor.

1,115,408. Optical Instrument. H. L. De Zeng, Maple Shade, N. J. Electric lamp is carried by test object.

1,115,419. Fire-Telegraph System and Apparatus Therefor. E. A. Faller, assignor to Industrial Realization Co., New York, N. Y. Opening the alarm-box doors closes the signal circuits.

1,115,440. Dynamo-Electric Machine. F. R. Kunkel, assignor to Westinghouse Electric & Mfg. Co. Has an annular deflector to deflect air currents between the stator coils.

1,115,446. Circuit-Controlling Device. O. M. Leich, assignor to Cracraft, Leich Electric Co., Genoa, Ill. Hook-switch mechanism for desk telephone.

1,115,447. Pothead or End Bell. H. P. Liversidge, assignor to Fairmont Electric & Mfg. Co., Philadelphia, Pa. Has a pair of interfitting cable-sheath-clamping members.

1,115,448. Circuit-Breaker. A. J. Logquin, assignor to Allis-Chalmers Mfg. Co. Relates to details of link mechanism.

1,115,452. Variable-Speed Direct-Current Generator. A. Richter, Chicago, Ill. Special field control for battery-charging machine.

1,115,455 and 1,115,456. Electrical Distribution System. P. H. Thomas, assignor to Cooper Hewitt Electric Co., Hoboken, N. J. Interconnected mercury rectifiers are used between a single-phase supply circuit and a direct-current work circuit in which is a steadying impedence.

1,115,458. Dry Cell. W. G. Waitt, assignor to National Carbon Co. The process of coating the inside of zinc cans with flour consists in applying a layer of oil and then adding the desired quantity of flour.

1,115,461. Electric Welding Machine. W. E. Andrews, Bellaire, O., assignor of one-half to W. A. Stellers. Transformer type with a horn electrode and a wheel electrode.

1,115,463. Electrode Element. T. A. Edison, assignor to Edison Storage Battery Co., West Orange, N. J. Comprises a tubular perforated inclosing pocket of conductive material and alternate layers of nickel hydroxide and metallic nickel compressed therein.

1,115,474. Automatic Typographic Apparatus. C. T. Moore, Washington, D. C., assignor to J. G. Coffin. Includes electromagnetically operated clutch.

Patents Expired.

The following United States electrical patents expired November 2, 1914.

592,760. Galvanic Battery. H. J. Brewer, New York, N. Y.

592,769. Method of and Apparatus for Relaying Telephonic Messages. A. W. Erdman, Milburn, N. J.

592,782. Chemical-Electric Generator. Henry K. Hess, Syracuse, N. Y.

592,802. Electric Diaphragm. N. Marchal, Dienze, Germany.

592,805. Electric Light Fixture. F. B. Mason, Brooklyn, N. Y.

592,815. Electric Conductor and Connection and Support Therefor. W. McElroy, Brooklyn, N. Y.

592,831. Electric Railway System. W. Robinson, Boston, Mass.

592,844. Apparatus for Electrically Treating Diseases. H. E. Waite, New York, N. Y.

592,853. Electric Battery. A. D. Wheeler, Hyde Park, Mass.

592,878. Dental Electrode. F. L. Morhard, New York, N. Y.

592,889. Distribution Board for Electric Currents. H. W. Shonnard, New York, N. Y.

592,923. Trolley-Wire Hanger. N. J. S. Hilaire, Gardner, Mass.

592,924. Automatic Heat-Regulating System. J. V. Stout, Easton, Pa.

592,928. Trolley for Electric Cars. E. C. Davis, New York, N. Y.

592,930. Insulating Coupling. C. F. Hummel, Brooklyn, N. Y.

592,951. Regulating-Socket for Electric Lamps. C. A. Chute, East Liverpool, O.

592,954. Signaling Apparatus. P. G. Hubert, New York, N. Y.

592,962. Electric Signal Apparatus. F. W. Cole, Newton, Mass.

592,965. Electric Motor for Street Cars. C. E. Emery, Brooklyn, N. Y.

592,973. Electrolytic Apparatus. E. Motz, Brewer Mine, S. C.

593,050. Alternating-Current Regulator. D. O. Hull, Clyde, O.

593,051. Electric Railway. R. M. Hunter, Philadelphia, Pa.

593,074. Railroad Switch. V. Angerer, Philadelphia, Pa.

593,094. Typewriting Telegraph. L. R. Hammond, New Haven, Conn.

593,138. Electrical Transformer. N. Tesla, New York, N. Y.

593,143. Electric Railway System. H. P. Wellman, Ashland, Ky.

593,154. Current-Collector for Electric Railways. F. A. Anderson, Washington, D. C.

593,167. Electromagnetic Circuit-Breaker. D. C. Spruance, Philadelphia, Pa., and M. Waddell, New York, N. Y.

Electric Vehicle Section

Electric Vehicles in England.

Among matters lately considered by the English Electric Vehicle Committee is the question of alarm signals for electrics. Earlier it had passed a recommendation that the signal should be in the form of a loud sounding gong, but the subject was raised again as experience had indicated that the gong was not sufficient in clearing away for the vehicles in crowded streets. The view is now expressed that a loud electrically operated horn is the best type of signal. Up to the present time 60 electric central stations in England have announced their intention to cater for the demands of the electric vehicle by a rate of two cents per kilowatt-hour for charging current taken at other than peak-load hours.

In announcing the approach of its new official quarterly organ, *The Electric Vehicle*, which is to fill the role of booster of electrics among public authorities from end to end of the United Kingdom, the Committee says: "It needs but little thought to realize what the extensive use of electrics will mean to almost every firm engaged in electrical engineering work, to electric-vehicle manufacturers, and to electric supply undertakings. The present is a most opportune time to launch the propagandist work in regard to what is, in point of fact, a money-saving machine. The more favorable charges for electrical energy, the higher cost of petrol, and the better nature of the road surfaces in England augur well for the electric vehicle" and suggests that there awaits it greater success than anything which has been so far achieved in America.

Saving by Electric Trucks.

The report of the Electrical Bureau of the city of Philadelphia says:

"The time required in repairing troubles on the underground system has been very much reduced by the use of an electric truck, the number of hours in which the underground circuits were out of service having been cut down in 1913 about 40 per cent as compared with 1912.

"The cost of operation in 1913 was a little less than for 1912, even with the greater amount of work.

"The forces employed were 20 as compared with 21 in 1912."

Boston Electric Car Salon.

The second Electric Automobile Salon, under the auspices of the Electric Motor Car Club of Boston, Mass., was held this week, opening Monday, November 2, and closing Friday evening, at Boston's leading hotel, the Copley-Plaza. The salon was open each day from 10 a. m. until 11 p. m.

Admission was by invitation card, and an admission price of $1.00 was fixed. More than 16,000 invitations were sent by mail to prominent people in the Boston district, representatives of automobile companies also sending cards to prospects. Press notices and advertisements in the Boston dailies have brought the salon into public attention. In addition window posters in hotels, clubs and stores, and dasher signs on street cars have given the salon wide publicity. Last year's salon was the only affair of its kind ever held in America, and attracted a large number of interested purchasers, resulting in the sale of over twenty cars.

The policy of the management was to permit no soliciting of purchases, the aim being to keep the salon a distinctly non-commercial affair. To this end the unique feature of music and dancing, with demonstrations of the newer dances by talented artists was added as an attraction this year.

Since the Boston Edison Company took up the electric-vehicle campaign five years ago, interest in this type of pleasure car has greatly increased in Boston, insuring the large attendance which this year's salon commanded.

The grand ball room of the hotel was the setting for the exhibits, while the entertainment features were provided in the small ball room adjoining. Simple but effective decorations were employed, but not to so great an extent as to divert attention from the main attractions of the salon, the handsome vehicles themselves.

The exhibitors and their cars, with a brief description of their novel features, follows:

Waverley cars were exhibited by the J. W. Bowman Company, Boston agents, and comprised a five-passenger silent limousine and a four-passenger brougham, both of 1915 model, the latter shown here for the first time.

The Buffalo Electric Company showed its 1915 "Cumulative Electric," which has automatic speed control and provides for the conversion of its motor into a generator which charges back into the battery, on down grades. A variable speed Diehl 3.75-horsepower motor is the driving agency, having a speed rating of 450 to 1,000 revolutions per minute with fields in series and 200 to 1,150 revolutions per minute in parallel. The speed control is through variable resistance in the shunt field. Fields thrown into parallel position give greater torque on low speeds, while in series position a moderate torque on high speed is provided. The model shown is provided with either 70 cells of A-4 Edison battery or 42 cells of 15-plate lead battery, as the purchaser may elect. A test of this car in Boston, on the steep grade up Beacon Hill, with one passenger besides the driver, showed the use of 65 amperes at 10 miles per hour, the run down the hill returning 23 amperes to the battery; this without the use of any mechanical brake. Cars of this type have a mileage on single charge of 80 to 90 miles, at 12 to 13 miles per hour.

Five models of the Detroit Electric were shown by Albert Weatherby, Boston representative. They comprised a rear-driven roadster having bevelled-gear transmission; a rear-driven brougham with worm drive, wire wheels and finished in Jacquard broadcloth; a duplex-drive brougham, a worm-driven roadster, and a new-model worm-driven cabriolet having wire wheels. All the cars are of 1915 model, the distinctive feature being that all controller mechanism is located on the chassis. All the cars shown are equipped with lead batteries except the cabriolet, which has the Edison battery.

D. C. Tiffany Company, Boston, exhibited a model 41, five-passenger worm-gear brougham, and a model 51, five-passenger helical - bevelled - gear brougham, both equipped with 44 cells of 11-plate batteries.

The Peerless Motor Car Company showed five Rauch & Lang carriages, of three types. These comprised a roadster, model R-5, broughams model B-5, and coaches of model J-5. A feature of these cars is the lever window lift.

S. R. Bailey & Company exhibited a

model F roadster, of their well known high-speed and long-mileage type.

Batteries were exhibited by the Edison Storage Battery Company, Philadelphia Storage Battery Company and Electric Storage Battery Company. The former exhibited the improvement known as the new boss suspension which is soldered onto the can and holds the cell in place by suspension on hard-rubber buttons instead of metal stirrups. The new Edison miners' safety lamp was also shown.

The Wagner Electric Manufacturing Company had an exhibit of rotary converters, in charge of Brooks Faxon, Boston representative.

The Salon was formally opened Monday evening, C. H. Miles, secretary of the Electric Motor Car Club of Boston and manager of the Salon, introducing Louis D. Gibbs, president of the club, who spoke on the growth and prospects of the electric automobile industry.

Washington-Philadelphia Electric-Vehicle Tour.

An effective demonstration of the touring capabilities of modern electric vehicles was afforded by the trip from Washington, D. C., to Philadelphia, Pa., and back again, of several Washington members of the Electric Vehicle Association of America attending the recent convention in Philadelphia.

Driving two Baker electric victorias, Frank T. Kalas, Washington representative of the Electric Storage Battery Company, and C. M. Marsh, secretary of the Washington Section, Electric Vehicle Association, accompanied by J. J. Bartram, H. B. Hart and E. S. Marlow, left Washington at 7 o'clock Saturday morning to make the 160-mile trip to Philadelphia in two days. Luncheon was eaten at Baltimore, where the vehicles received a short "boosting" charge; and in the afternoon the journey was continued via Towson, Md., to Havre de Grace, Md., where the machines were put on charge for the night.

Early Sunday morning the tourists continued via Perryville and Elkton to Wilmington, where men and batteries again received noon refreshments. From Wilmington via Chester to Philadelphia was an easy run, Philadelphia being reached at 4:30 p. m.

The trip was noteworthy both for its length, unusual for electric vehicles, and for the fact that the machines were purely stock models equipped with 28-cell type MV-9 Ironclad-Exide storage batteries regularly furnished.

According to the tourists, the roads were in rather indifferent condition, being largely worn macadam or hard-rolled dirt roads.

Electric Vehicle Appliances of General Electric Company.

Improvements of more or less importance have been made in the electric vehicle appliances manufactured by the General Electric Company.

The requirements of the public garage demand convenient switching apparatus for charging a number of electric automobile batteries at the same time from the same source of supply. The panels described herewith have been developed after a thorough inquiry into the actual needs of garage owners, and electric-vehicle manufacturers and they will be found to be of most practical design and admirably adapted to the purpose for which they are intended.

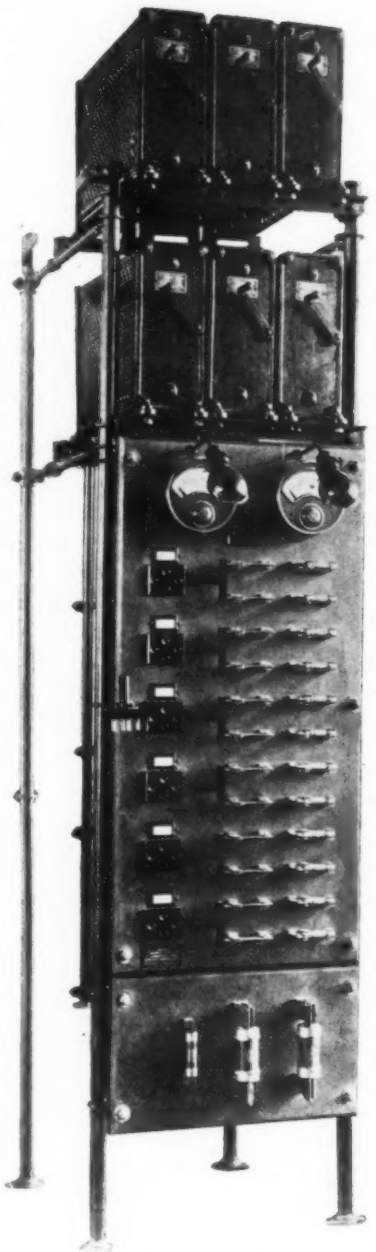
The panels are standardized for service from two-wire and three-wire mains, for two, four and six charging circuits, and with and without subbases or bases in the rear with fuses for the incoming line.

It is possible to add charging sections without instruments to two- and four-circuit panels already installed, when more circuits than may have been contemplated at the time of the initial installation are to be controlled, but these are not standardized as it is necessary to make a special provision for the connection bars.

One of the illustrations shows the front view of a six-circuit panel complete with fused subbase. Any number of these panels may be assembled together to form a continuous switchboard where large numbers of batteries are to be charged simultaneously. In this case, however, it is necessary for the purchaser to install a common bus preferably beneath the floor with cables connecting this to the panels.

The charging rheostats are mounted compactly above the panels and the rheostats are operated conveniently by means of a special operating hook. This method of mounting will recommend itself to garage owners, particularly where the floor space is limited and also because the complete control of any circuit is immediately under the hand of the operative. Furthermore, this method of mounting permits of the most convenient running of the leads from the circuit switch to the rheostats, and thence along the wall to the various vehicle-charging plugs.

Each of the battery-charging circuits is controlled by a double-pole, double-throw, lever switch which, when opened, cuts off completely both sides of the circuit from the source of supply. The right-hand side of the switches is the regular charging side, and is furnished with inclosed fuses for the protection of the circuit in case of trouble in the batteries, rheostats, or connecting leads. The left-hand side



Front View of Six-Circuit General Electric Charging Panel.

is connected to the ammeter bus, so that the charging current on any circuit may be read on the ammeter when the switch is thrown in that position. However, the current can be indicated through only one battery circuit at a time. The ammeter is provided with an individual fuse (mounted on the back of the panel) for the protection of the instrument in case two or more switches should be thrown to the left-hand (ammeter) position simultaneously and also to provide protection against possible trouble in the individual circuits during the time that the circuit is being read. Potential recep-

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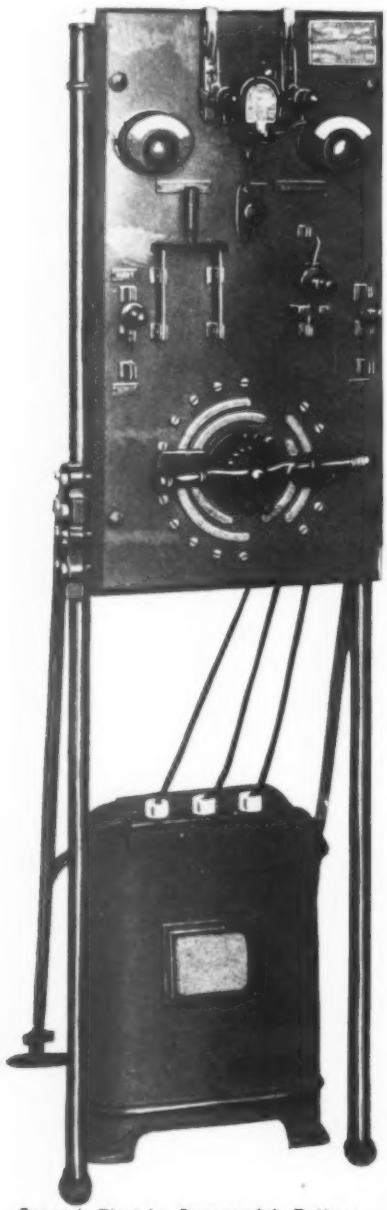
tacles and the necessary plug (with holder) are furnished so that the voltage of the source of supply can be read on the voltmeter and also the voltage applied to any of the batteries outside the charging rheostats. As only one plug is furnished with each panel equipment, there is no possibility of the operator making a short-circuit on the potential bus.

While the panels are primarily designed for service from direct-current city mains, they are perfectly adapted for use in connection with panels controlling motor-generators or generators driven by prime movers; a generator panel in such cases is usually provided with overload and reverse-current breakers so that the fused subbase is ordinarily not required with the charging outfit proper.



General Electric Commercial Battery. Charging Rectifier Set.

Rectifier Sets.

The commercial battery-charging rectifier set is shown in one of the accompanying illustrations. This rectifier is made in five standard sizes, of 10, 20, 30, 40 and 50 amperes capacity, and in direct-current voltages ranging from 10 to 100 when operated from 110 volts, alternating current, and from 20 to 175 when operated from 220 volts. This rectifier is suitable for operation on circuits of 60 cycles or more.

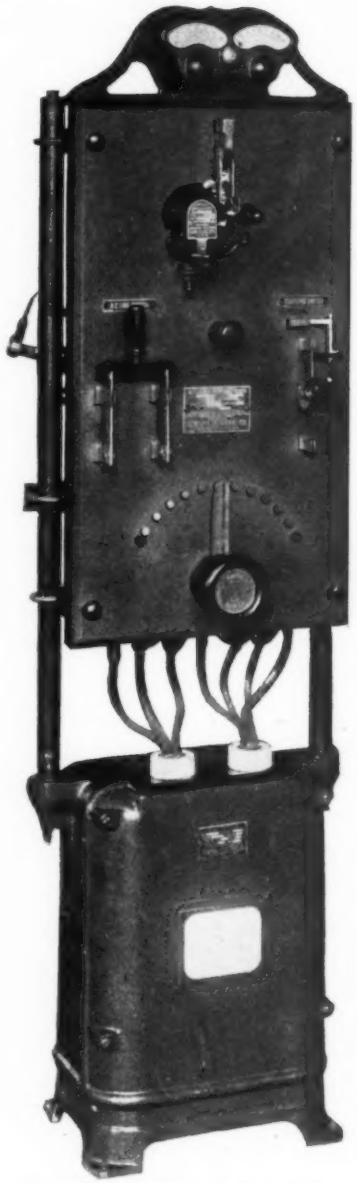
Particular attention is called to the completeness of this charging set. It is supplied with ammeter and voltmeter for indicating the direct-current output, and with a double regulating dial switch having seventeen contact buttons, six of which are connected to rough regulation and eleven to fine regulation taps, on what is termed a "regulating compensator." This compensator is designed to give a very wide range of alternating-current voltage across the anodes of the rectifier tube, and consequently a wide range of voltage from the direct-current side of the rectifier.

In operation this rectifier is simple. After the set is adjusted for the proper direct-current voltage output, the alternating-current line switch is closed; the circuit-breaker closed, the spring starting switch on the right-hand side of the panel moved up and held while the tube is rocked to form the necessary starting arc. As soon as the arc is formed, the starting switch is released, and it automatically springs into the load position, when the rectifier begins charging the storage battery.

The reason for the starting switch and the starting load resistance to which the upper clip is connected is that the rectifier will not readily start against the counter electromotive force of the battery, making it desirable to have the auxiliary starting load resistance, which is a non-inductive resistance, mounted on the back of the panel, as a starting load.

The efficiency of this type of rectifier, or, in fact, any other type of mercury-arc rectifier, will vary with the direct-current voltage output, since there is a definite voltage drop in the mercury arc in the tube, irrespective of the current or voltage. Therefore, on the low voltages, the efficiency is lower than on the higher voltage. The efficiency of the rectifier is practically the same from one-third current up to the maximum current output, though slightly greater at the low current than at the higher.

One of the accompanying illustrations shows a new type of rectifier which, on account of the work for which it is designed, has been designated as the Runabout type. It is built with a minimum number of parts and is extremely simple in construction.



General Electric Runabout-Type Battery Charging Rectifier Set.

In this rectifier there is a main reactance, the winding of which is equipped with four taps which make possible the connecting of the rectifier for various direct-current voltages covering a range sufficient to charge all the ordinary lighter electrics. The main reactance, designated the "compensating reactance," stands on the floor. The top contains two receptacles for receiving the two panel pipe supports on which is mounted the rectifier panel. On the back of the panel is a suitable holder for the rectifier tube. For use in rocking the tube, a small handle is mounted on the front

Gould Storage Battery

A PROMINENT packing company in Buffalo put a new 3½-ton electric truck into service in June, 1913, and specified a Gould Battery for motive power. This truck, in mornings alone, does work which formerly required one two-horse and two one-horse teams all day. Then in the afternoon the truck does the freight work which formerly required another two-horse team.

In regular service this truck covers about 55 miles per battery charge, the cost for charging current at Buffalo's new rate being less than 1 cent per mile. Did you ever hear of such economical delivery?

On a recent trip, full load was carried around Eden Valley, over one of the worst hills in western New York, and over four miles of sandy road, making a total of 52 miles.

After 6,000 miles of hard work, during which the truck frequently carried from ½ ton to 1 ton overload, the battery plates were, to all appearances, as good as new and the truck had missed only one day of service—that due to disarrangement of the charging system.

This packing company has now equipped all of its 2-ton trucks with Gould Batteries.

Gould Batteries would show you the way to the same kind of service. Tell us your requirements so we can quote. Gould renewals fit jars of any make.

Ask for booklet, "What Gould Vehicle Batteries Are Doing."

Gould Storage Battery Co.

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BOSTON: 14-16 Cambria St.
PHILADELPHIA: 613 Betz Bldg.
CLEVELAND: 1761-5 E. 18th St.
DETROIT: 88 E. Congress St.
CHICAGO: 225 E. 22nd St.
SAN FRANCISCO: 1448 Van Ness Ave.
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These qualities of economy and reliability are emphasized in GMC Electrics because of exclusive features that make for easy care, low maintenance cost and simplest operation.

There are eight load capacities from 1000 lbs. to 6 tons, each in varying chassis lengths—a truck for every business need.

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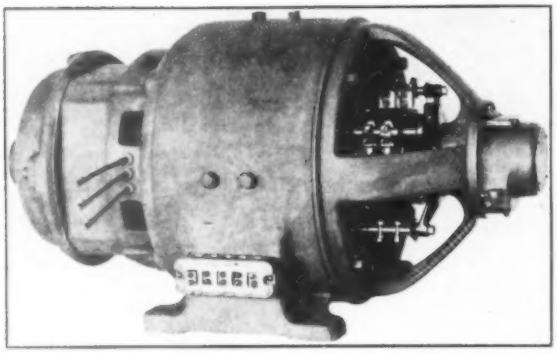
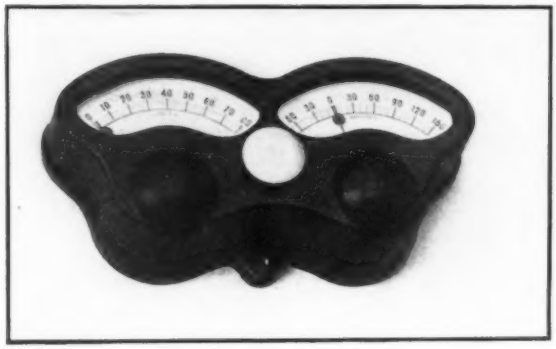
PONTIAC, MICHIGAN

Branches: New York, Boston, Chicago, Philadelphia, Kansas City, Detroit, St. Louis.



General Electric Type MIC Motor-Generator Set.



General Electric Type DK-3 Combined Ammeter and Voltmeter.

of the panel. The panel is equipped with a main line switch, a single-pole circuit-breaker for protection against overload, and a starting switch for connecting the rectifier temporarily to the starting resistance load.

To obtain a regulation of the charging current, a reactance coil is connected in series with the alternating-current supply. This coil has eleven taps connected to as many buttons of a semi-dial switch similar in many respects to the ordinary rheostat switch. This makes it possible to efficiently vary the charging current and voltage over the entire range required by any battery which the rectifier is designed to charge. In order to minimize the cost, this type of rectifier is not regularly equipped with ammeter or voltmeter, although it can be so equipped.

The runabout type of rectifier is designed for operation on 60 to 140 cycle, 110 or 220-volt alternating-current supply. It can be furnished in 30, 40 and 50 amperes capacity.

Motor-Generator Sets.

The General Electric motor-generator sets are of two general types. One type consists of a direct-current generator driven by a direct-current motor and one a direct-current generator driven by an alternating current motor. One of the latter type is shown in one of the accompanying illustrations.

These sets range in capacity from 0.2 kilowatts to 10 kilowatts and are equipped with 125-volt shunt-wound generators and 110 or 220-volt single or polyphase motors. The speed of this type is 1,800 revolutions per minute.

Instruments.

The combination of ammeter and voltmeter which is known as the Type DK-3 automobile instrument was designed primarily for use on electric automobiles but the design with slight modification lends itself so well to some classes of switchboard work that it has been adopted for use on the direct-current private garage type of panels. The instrument contains two D'Arsonval elements so that, electrically, it is identical with the switchboard instruments. This insures accuracy and reliability under the most trying conditions of service. The design and construction are such that the instrument when used for this class of service will withstand without injury the constant vibration and exposure to which it is subjected. The magnets used in the instrument are made from the best quality of magnet steel obtainable, this being put through a special hardening and aging process which insures almost absolute permanency. Type DK-3 instruments are dead beat and the scales are very open and have evenly spaced divisions throughout their range. The terminals are in the base and are so arranged that the wiring can be installed in the car and the instrument placed in position after the upholstering is finished. Each instrument is equipped with a small two candlepower lamp which is placed within the case so that no objectionable reflectors or shades are necessary. Lamps of different voltages can be furnished. When the instrument is used for automobile service a zero center scale is furnished for the ammeter as the current must be indicated both on charge and discharge, but when furnished for switchboard use, this is not usually necessary.

Vehicle Motors.

The ultimate success of any type of electric vehicle depends very largely upon the efficiency of the propelling motor.

The motor to attain the maximum possibilities for this service should embody in its design those features which assure the necessary structural strength combined with high torque per ampere values, well chosen speed characteristics, high efficiency at all loads and ample overload capacity.

General Electric Automobile Motor.

While unnecessary weight is to be avoided, the use of iron and copper can not be unduly stinted without materially reducing the high electrical qualities so essential where the source of power is limited, as when derived from storage batteries.

The General Electric Company's universal type of automobile motor has embodied to the fullest extent the theoretical possibilities in its torque, speed and efficiency characteristics combined in a strongly constructed yet light weight motor.

The torque per ampere is relatively high and increases in direct proportion as the current increases, and this without causing a material decrease in efficiency when the motor is exerting extra power or operating on overload.

The frames are made from cast steel, cylindrical in form, and are accurately machined, thus being readily applicable to the various special forms of suspension employed.

Ball bearings are used throughout, affording a reduction in dimensions, friction losses and weight.

While the standard line of automobile motors includes only nine sizes of frames, this number is successfully meeting the pleasure and commercial demands of all classes of service, from the light runabout, coupe, or speedy roadster to baggage trucks or those built for heavy loads.

The United States is now the largest consumer of copper, and will probably continue to use more of that metal than any other country for a long time. Since the outbreak of the European war, the copper demand in nearly all countries has seriously declined, but not to the same extent in this country as in the other nations using copper extensively.

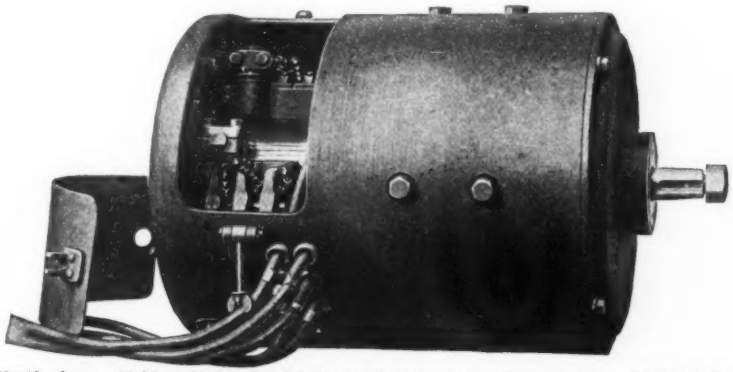
Twice Around the World
And Starting the Third Lap 10% above Rated Capacity
Truck No. 37 of the Chicago Commonwealth Edison Company has beer operated constantly for 4 years and has traveled over
50,000 Miles — Equivalent to twice around the earth
The Edison Battery is Guaranteed for 4 years to be Capable of Developing Its Full Rated Capacity
The original Battery of 60 A-6 Edison cells installed in Truck No. 37 in 1909 with a rated capacity of 225 ampere hours is still operating it and gave on bench test a few weeks ago 247½ ampere hours. During the four years the Electrolyte was renewed twice. There were no other renewals or repairs of any kind on the battery. Another Edison Storage Battery in similar service is just entering its sixth year.
Mr. Edison is still waiting for a properly installed Edison Battery to show signs of giving out.
EDISON STORAGE BATTERY CO., 105 Lakeside Ave., Orange, N. J.

Westinghouse Electric Vehicle Motors

The Westinghouse Electric & Manufacturing Company manufactures a complete line of vehicle motors for all types of electric cars, from the smallest runabout to the largest truck.

Two windings are provided for each size of frame—one for 60 volts and the other for 80 volts, to be used principally with Edison and lead batteries respectively. Both windings have equal watt ratings at the same torque and speed. A car, therefore, equipped with a lead battery can be arranged to operate with an Edison battery (and vice versa) without changing the motor suspension or the mechanical transmission system.

The design is such as to secure great strength with a simple arrangement of few parts. Practically the only attention required is a periodic inspection to renew brushes, when worn, and to replenish lubricant.



Westinghouse Vehicle Motor for Light Service Such as Pleasure Cars, Light Delivery Wagons, Etc.

The commutation is sparkless even under the severest conditions of trucking service, where often six or more times normal current must be commutated. The efficiency of operation is high throughout the entire range of loads and especially on extreme overloads.

The frame is of steel. Hand-hole covers are dust and water proof and are so arranged that the interior of the motor can be easily inspected without interfering with the straight alinement of brake rods, etc.

The bearing housings are arranged so that the lubricant cannot work into the motor. It is discharged outside through a passage that is too large to clog with dirt and grease. Fresh lubricant can be added without removing the motor from the car.

The brushes are bolted securely to the frame but can be easily adjusted for backward lead in either or both directions of rotation. Braided shunts protect the brush springs from the current; they are fastened to the brushes without solder, so that there is no danger of the brush sticking to the box from solder that has melted and then solidified.

The armature is provided with ventilating ducts, insuring an unrestricted circulation of the air and preventing the formation of hot spots. All parts are designed so that quiet operation is secured.

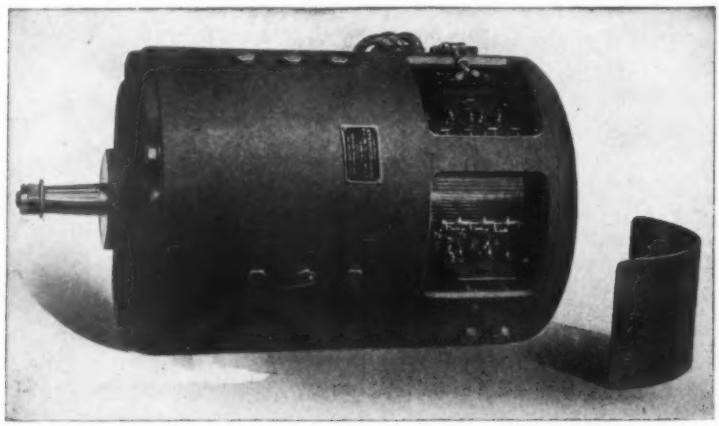
Battery-Charging Outfits.

Battery-charging rheostats, for charging cars from direct-current circuits of from 60 to 125 volts, are supplied in all capacities for either switchboard or separate mounting.

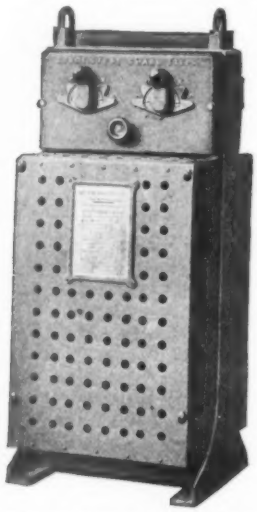
Westinghouse-Cooper Hewitt recti-

fiers, for charging cars from alternating-current circuits, known as type AN outfit, converts alternating current to direct current, and automatically cuts down the charging current as the charge proceeds, producing the "tapering current characteristic" desirable for lead batteries.

The type AA outfit automatically restarts itself if for any reason the power is cut off temporarily, which makes charging at night possible. The type AE performs the same functions as the type AA except that it produces a "flat current characteristic," which is necessary for Edison batteries. A time switch can be used with any of the outfits to stop the charge.



Westinghouse Vehicle Motor for Heavy Truck Service.



Westinghouse-Cooper Hewitt Rectifier.

The types AN and AA outfits are made in two sizes, either for 14 to 32 cells or for 20 to 44 cells. The maximum charging current is 30 amperes and there are 25 points of regulation.

The type AE outfits for Edison storage cells are suited for batteries of 20 to 60 cells. The maximum charging current is 40 to 50 amperes depending on size of outfit, with 49 points of regulation. All these outfits are suitable for ordinary alternating-current lighting circuits of 110 or 220 volts.

Motor-generator sets and charging switchboards, for charging any number of cars of all types at once from any kind of supply circuit are arranged so that all charging operations are controlled from the front of the panel. The charge is regulated by means of meters on the board, and safety devices affording protection from overload and reverse circuit can be supplied if desired. The switchboard is made of sectional type panels and can be assembled for charging any number or type of batteries from any power circuit.

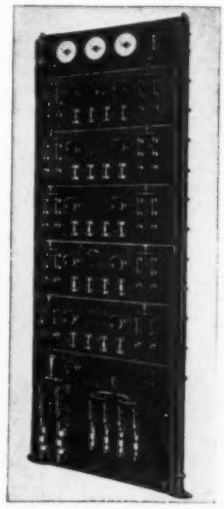
Motor-generator sets can be supplied for operation on any power circuit and for supplying current of any amperage. The generator voltage can be adjusted so that it is but slightly higher than that actually needed for charging at any given time, reducing to a minimum the waste of energy in resistance.

Miscellaneous Applications.

The Westinghouse Company also supplies the following electrical equipment used by electric-vehicle manufacturers and garages: Vehicle controllers, cutout switches, charging plugs and receptacles, tire vulcanizers, portable electric drills and grinders, polishing and grinding lathes, ventilating fans and blowers, automobile lamps, motors for driving machine tools, vacuum cleaners, tire pumps, water pumps, etc.

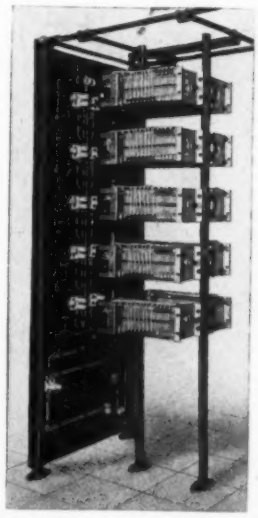
Telephones for Irish Farmers.

The British Postmaster General is seeking to increase the use of telephones among the farmers of Ireland. A special rate has been arranged whereby three or more farmers on a line not over one mile in length can have unlimited local calls at $14.60 each per annum. No line will be established for less than three subscribers; but subject to this restriction lines may be used by subscribers not closer together than two in a mile, at the rate of $17.03 per year. Subscribers must, of course, be located on the same road or route from the central or town exchange. For calls beyond the limits of the town exchange a charge of 2, 4, or 6 cents per conversation is made, according to distance, within a 25-mile radius, or of 12 cents within a 50-mile radius. The extreme radius is about 100 miles.



Front View Sectionalized Battery-Charging Panelboard.

From the statements issued by the secretary of the general post office at London in advertising this new plan, it is evidently regarded as a means of ameliorating rural conditions in Ireland and of augmenting comfort and industrial efficiency. The multifarious uses to which telephones may be put are set forth as attractively as possible.



Rear View Sectionalized Battery-Charging Panelboard.